

PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG265CI: Theory of Structure-I (New Course)

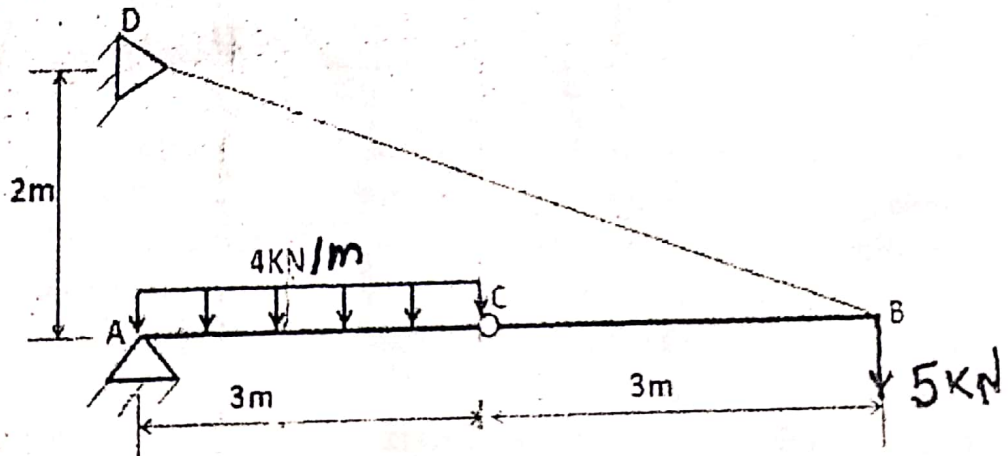
Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume necessary data appropriately if required.

Answer FIVE questions.

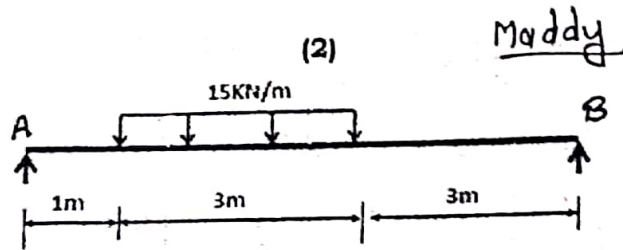
5×16 = 80

1. Points A, B and D are pin jointed. AB is RCC beam of 200 mm breadth and 400mm depth. BD is a steel wire of 10mm diameter. Find the vertical deflection at C due to bending of beam AB and axial tension of wire BD. Take $E_{\text{steel}} = 2 \times 10^6 \text{ kg/cm}^2$ and $E_{\text{concrete}} = 1 \times 10^5 \text{ kg/cm}^2$. 16

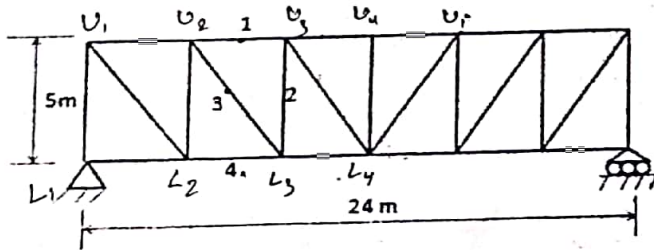


- 2(a) A rectangular beam 20 cm x 40 Cm (b×d) is simply supported on a span of 6m and carries a cntral load of 200 kg. Calculate the strain energy due to shear and bending. Neglect self-weight of the beam. Take $E = 2 \times 10^6 \text{ kg/cm}^2$ and $G = 0.85 \times 10^6 \text{ kg/cm}^2$. 8
- (b) A beam AB of length 7m is loaded with a UDL as shown in fig. Determine the central deflection of the beam by using moment area method. 8

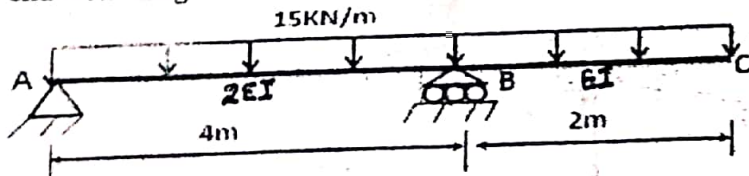
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3. A Parallel chord through type N- truss as shown in fig. Draw the influence line diagram of member 1, 2, 4 and find the maximum force in the member 3; (i) when a concentrated load of 100KN rolls over the truss (ii) when 40 KN/m udl of 3m long rolls over the truss. 2+2+2+5+5



- 4(a) A system of 5 loads of 80KN, 160KN, 160KN, 60KN and 40 KN cross a beam of 15m span with the 40KN load leading. The distance between the loads is 2.4m, 3.0m, 2.4m and 1.8m respectively. Find the maximum bending moment at the centre of the span. Also find the absolute maximum bending moment of the beam. 8
- (b) Using conjugate beam method; determine vertical deflection of free end C for the given beam. 8



5. A three-hinged parabolic arch, ACB is hinged. The left support A and right support B which is below the crown hinge C by 3m and 6m respectively. The span of the arch is 22m. The arch carries a uniformly distributed load of 30KN/m from A to C. Find the maximum positive and negative bending moment. Draw bending moment diagram. 16

(3)

- 6(a) A cable is used to support six equal and equidistant loads over a span of 14 meters. The central dip of the cable is 1.6 meters and the loads are 20KN each. Find the length of the cable required and its sectional area, if the safe tensile stress is $15 \times 10^4 \text{KN/m}^2$. 10
- (b) Prove that strain energy due to shear for rectangular beam is equal to:

$$U = 1.2 \int_0^L \frac{V^2 dx}{2GA}$$

$$y = \frac{2hx}{L^2} (L-x)$$

PURBANCHAL UNIVERSITY

2017

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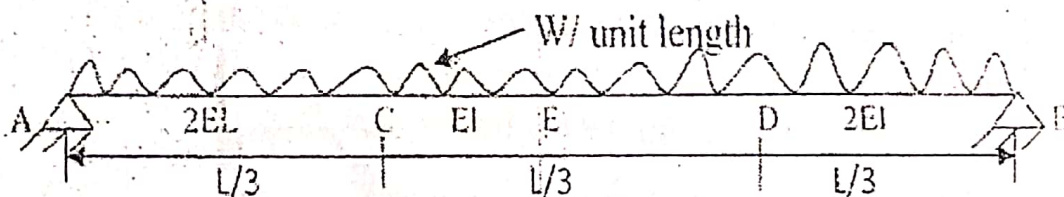
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Answer FIVE questions.

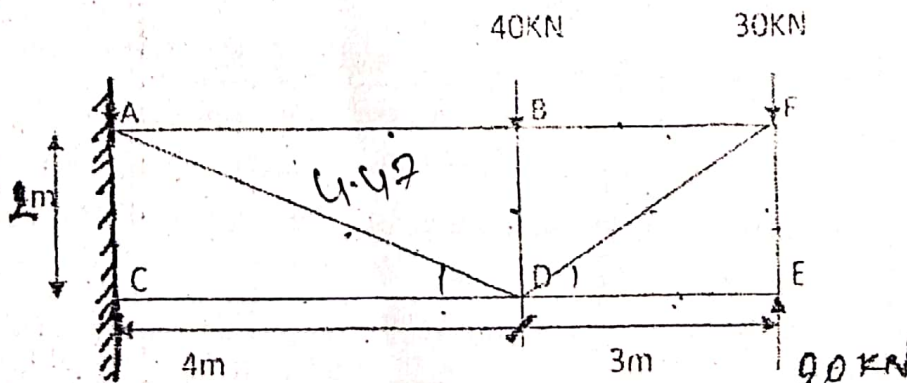
5×16 = 80

1(a) Define linear and non-linear systems. 4

(b) Determine the slope at A, deflection at C and mid span E in the beam shown in figure, using moment area method. 12



2. Determine the vertical deflection of joint D in the truss shown in fig. the cross sectional areas of Members AD and DE are 2500mm^2 while those of the other members are 1500mm^2 . Take $E = 200\text{KN/mm}^2$. If the temperature of bottom chord members goes down by 20°C , What will be the additional deflection of joint D? Given $\alpha = 12 \times 10^{-6}/^\circ\text{C}$. If the AD and DF members are 10mm too long before fabrication, what will be the deflection of joint due to lack of fit alone? 16



$\sqrt{2 \times 4^2}$

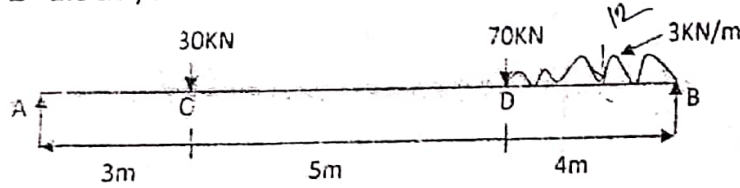
ntd. ...

(2)

$I_x = 48 \times 8$

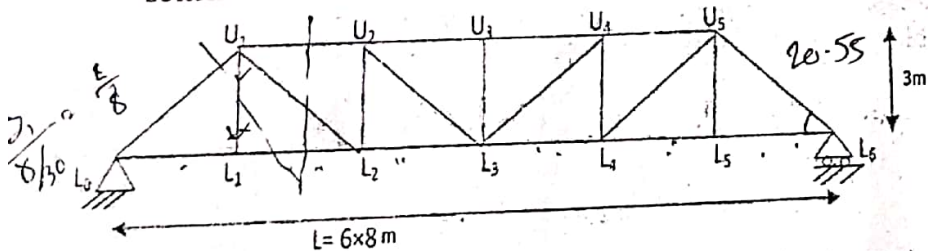
(3)

- 3(a) A simply supported beam of span 12m carries two point loads and UDL as shown in fig. Calculate the deflection of the mid span using moment area method. Take $I = 16 \times 10^3 \text{ cm}^4$ and $E = 2.1 \text{ KN/cm}^2$.



- (b) A round prismatic bar of length 2m and diameter 15mm hangs vertically from a support at the upper end. A sliding collar of mass 20 kg drops from a height of 50mm onto the flange at the lower end of the bar. Determine the impact factor and the maximum elongation, maximum tensile stress and maximum strain energy stored due to the impact. Take $E = 200 \text{ GPa}$.

4. Draw the ILD for forces in members U_1L_2 , U_1U_2 , L_1L_2 and U_1L_1 of the frame shown in figure, the load moves from left to right on bottom chord.



- 5(a) Four point loads 8, 15, 15 and 10 KN have centre to centre spacing of 2m between consecutive loads and they traverse a girder of 30m span from left to right with 8KN load leading. Calculate the maximum bending moment and shear force at 8m from the left support.

- (b) A three hinged parabolic arch hinged at the support and at the crown has a span of 24m and a central rise of 4m. It carries a concentrated load of 50KN at 18m from left support. Determine the moment, thrust and radial shear at a section 6m from the right support.

- 6(a) Give reason why Arch is economical than beam.

- (b) A suspension bridge of 130m span has two three hinged stiffening girders supported by two cables having a central dip 10m. The roadway has a width of 7m. The dead load on the bridge is 5 KN/m while the live load is 10 KN/m^2 which acts on the right half of the span. Determine the shear force and bending moment in the girder at 25m from the right end. Find also the maximum tension in the cable for position of live load.

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PURBANCHAL UNIVERSITY

2016

B.E. (Civil)/Fourth Semester/-Final

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Answer FIVE questions.

5×16 = 80

1. Determine vertical deflection of point C if truss is loaded as shown in Fig. (1). If the member CD and DE are subjected to a temperature fall of 20°C than other members, find the total deflection. The cross sectional area of the diagonal, horizontal and vertical members are 5cm^2 , 12cm^2 , and 16cm^2 respectively. Take $E=20.7\times 10^3\text{ kN/cm}^2$, $\alpha=12\times 10^{-6}/^{\circ}\text{C}$. 16

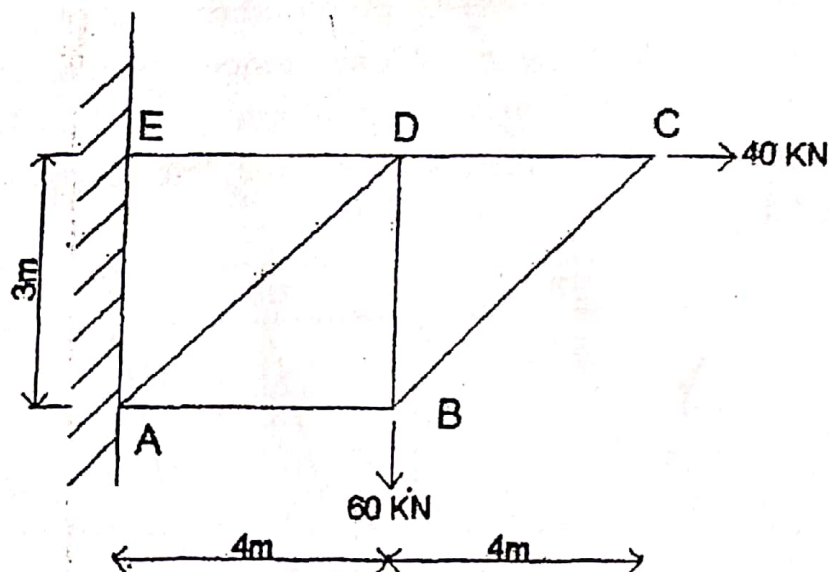


Fig. 1

- 2(a) Find the instantaneous maximum deflection and bending stress for a $60\text{mm}\times 60\text{mm}$ steel beam simply supported a span of 2m. The beam is struck at mid-span by a 200N weight falling from a height of 120mm above the beam. Take $E= 200\text{GPa}$. Also find the maximum deflection and bending stress when the load is suddenly applied. 12

Contd. ...

(2)

- (b) What are the differences between statically determinate and indeterminate structures with examples? 4
- 3(a) Explain various types of arch with illustrative diagrams. 4
- (b) Determine the rotation and deflection at the free end in the overhanging beam shown using conjugate beam method. 12

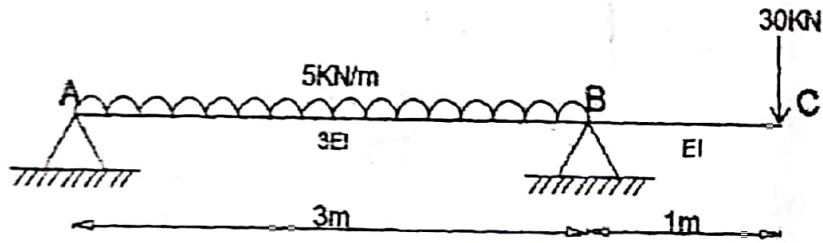


Fig. 3(b)

4. Draw the ILD for forces in members U_3L_4 , U_3U_4 , U_3L_3 of the truss shown in figure below. Hence, determine the maximum forces developed in the members when a UDL of 50 kN/m, longer than the span, moves from left to right on the bottom chord. 16

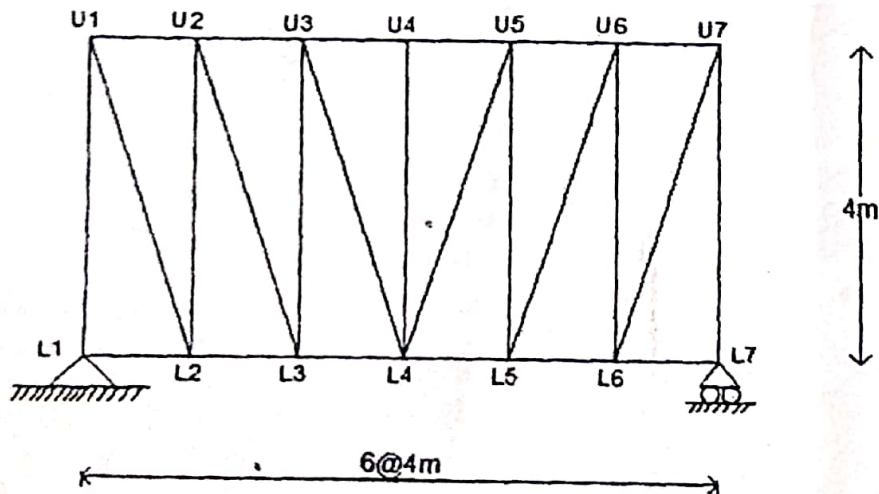


Fig. 4

(3)

5. Determine moment, thrust and radial shear for a three hinged arch which is hinged at support and at the crown has a span 12m with central rise of 3m. It carries a concentrated load of 12kN at crown and a UDL of 6kN/m runs over full portion.
6. A bridge of span 120m span is suspension three hinged and supported by cables have a central dip of 10m.

Road way width = 5m

Dead load on bridge = 10 kN/m²

Live load = 12 kN/m² act on right half of span

Determine shear force and bending moment in girders at 20m and 40m from right end. Find also maximum tension in cables for this portion of load.

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PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Fourth Semester/Final

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BEG265CI: Theory of Structure-I (New Course)

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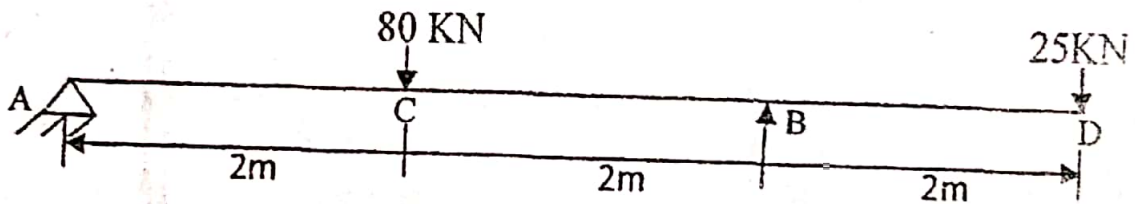
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Answer FIVE questions.

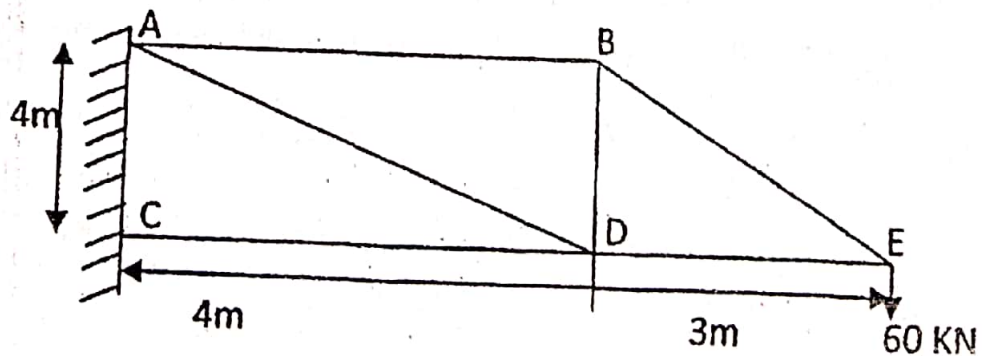
5×16 = 80

1(a) Write the methods of structural analysis. 4

(b) Determine the slope and deflection at the end of the beam shown in figure. Assume EI is constant throughout using moment area method. 12



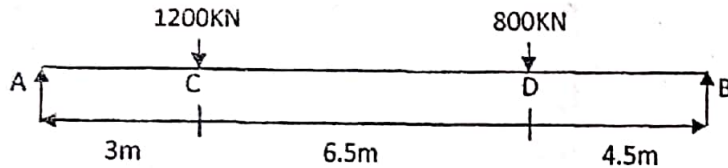
2. Determine the vertical deflection of joint E in the truss shown in figure. The cross sectional areas of Members AD and DE are 1500mm² while those of the other members are 1000mm². Take $E=200\text{KN/mm}^2$. If the temperature of bottom chord members goes up by 20°C, What will be the additional deflection of joint E? Given $\alpha=12\times 10^{-6}/^\circ\text{C}$. If the AD members are 10mm too short before fabrication, what will be the deflection of joint due to lack of fit alone? 16



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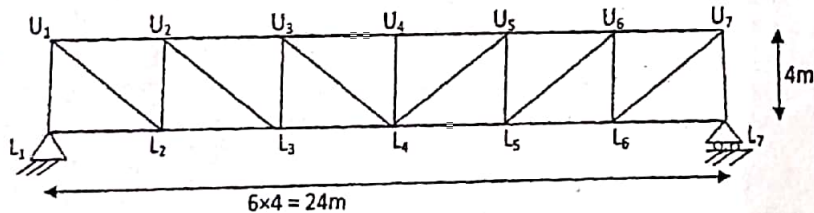
(2)

- 3(a) A simply supported girder of span 14m carries two point loads of 1200 KN and 800 KN as shown in fig. Calculate the deflection of the girder at points under the two loads using Macaulay's method. Take $I=16 \times 10^3 \text{ cm}^4$ and $E=2.1 \text{ KN/cm}^2$. 8

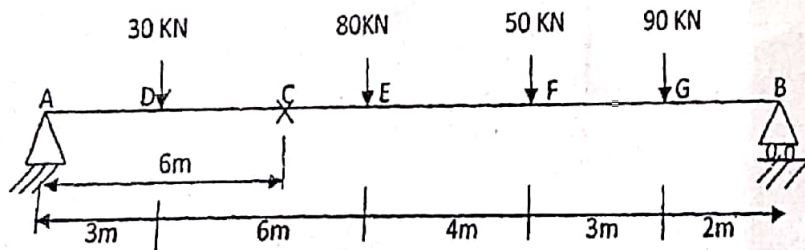


- (b) A rectangular beam 25cm x 50cm is simply supported on a span of 8m and carries a central load of 300 kg. Calculate the strain energy due to shear and bending. Neglect self-weight of the beam. Take $E=2 \times 10^6 \text{ kg/cm}^2$ and $G=0.85 \times 10^6 \text{ kg/cm}^2$. 8

4. Draw the ILD for forces in the members $U_3 L_4$, $U_3 U_4$ and $U_3 L_3$ of the frame shown in figure and find the maximum forces developed, when UDL of intensity 40 KN/m, longer than the span moves from left to right on bottom chord. 16

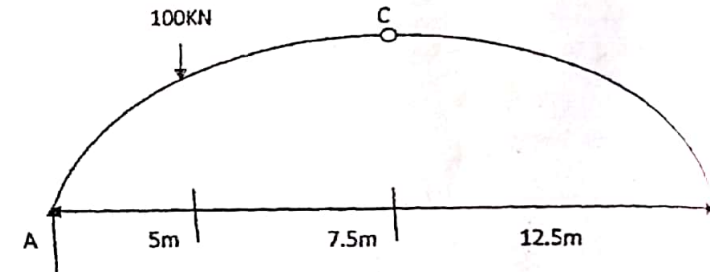


- 5(a) Using ILD determine the shear force and bending moment at section C in the simply supported beam shown in figure. 8



(3)

- (b) A circular arch of span 25m with a central rise 5m is hinged at the crown and springing. It carries a point load of 100KN at 5m from the left support. Calculate the reactions at the support and crown. Also find the moment, normal thrust and shear at section 7m from the left support.



- 6(a) Write down about the types of arch with sketch.

- (b) A three hinged stiffening girder of a suspension bridge of span 100m is subjected to two point loads of 200KN and 300KN at the distance of 25m and 50m from left end. Find the shear force and bending moment for the girder at a distance 30m from left end. The supporting cable has a central dip of 10m. Also find the maximum tension and its slope in the cable.

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PURBANCHAL UNIVERSITY
2014 (New)

(Civil)/Fourth Semester/Final

Time: 03:00 hrs.

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BEG255CI: Theory of Structure-I

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Answer FIVE questions. Assume necessary data if required.

- 1(a) Discuss on types of structures. 4
- (b) Calculate vertical deflection and slope at free end of the given overhanging beam by moment area method. 12

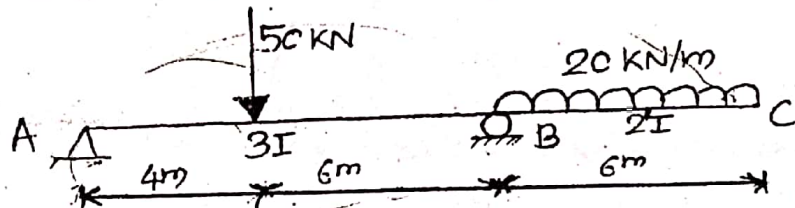


Fig. 1(b)

2. Determine horizontal deflection at joint D of the given truss. Take $AE = \text{constant}$ for all members. 16

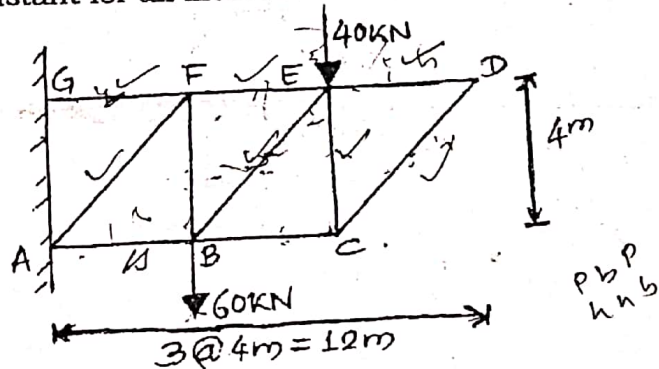


Fig. (2)

- 3(a) A simply supported beam $50\text{cm} \times 30\text{cm}$ of span 6m carries 20 kN load at one third of span from left support. Calculate strain energy due to shear and bending. Take $E = 200 \text{ kN/mm}^2$ and $G = 0.85 \text{ MPa}$. 8

Contd. ...

(2)

(b) Prove by conjugate beam method that the maximum deflection in a simply supported beam of length 'l' loaded with udl of intensity 'w' throughout its span and having flexural rigidity constant is equal to $5wl^4/384EI$. 8

4. Draw ILD for SF and BM at a section 5m from right support for a simply supported beam of span 15m. Also determine the maximum SF and BM at that section when a truck with front wheel load 5000kg and rear wheel load 10000kg crosses the beam from left to right 16

5. Find bending moment, shear and thrust at point P of given 3-hinged arch. 16

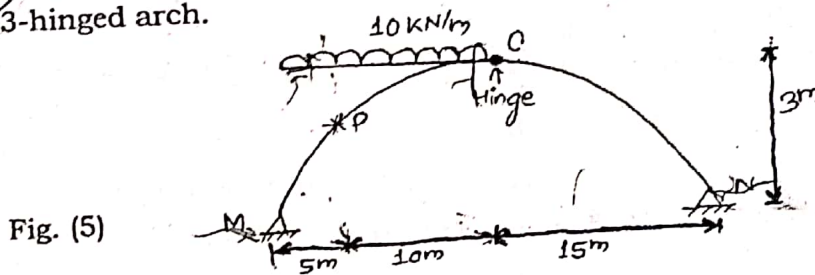


Fig. (5)

6(a) Draw ILD for member forces in 2-9 and 2-3. 8

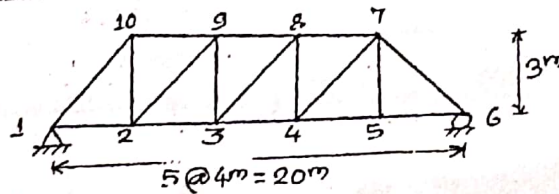


Fig. 6(a)

(b) A cable is suspended and loaded as in Fig. 6(b). Calculate length of the cable. ii) Determine magnitude & position of maximum tension in the cable. 8

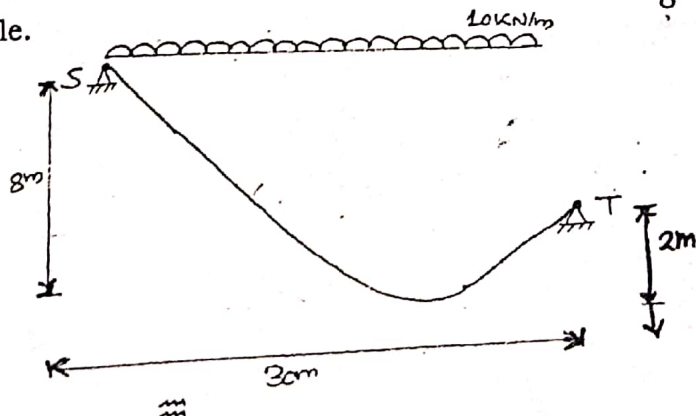


Fig. 6(b)

PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Fourth Semester/Chance

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BEG265CI: Theory of Structure-I

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Answer FIVE questions. Assume necessary data if required.

- 1./ Find the vertical and horizontal displacement at joint 'D' under the application of load shown in figure (1). Relative I values are indicated along the members. Take $E = 200 \times 10^6 \text{KN/m}^2$ and $I = 300 \times 10^{-6} \text{m}^4$. 16

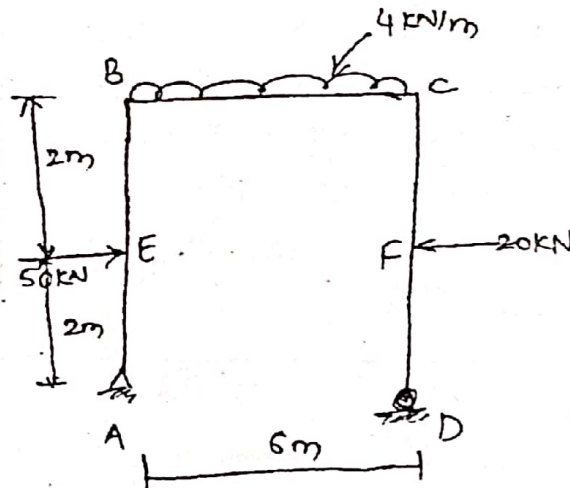


Fig. (1)

- 2(a) How can you convert a real beam into conjugate beam? Explain with an example. 4
- (b) Find the slopes and deflections at C and D using conjugate beam method or moment area method. Take $E = 200 \times 10^6 \text{KN/m}^2$, $I = 300 \times 10^{-4} \text{m}^4$. Neglect the weight of the beam. 12

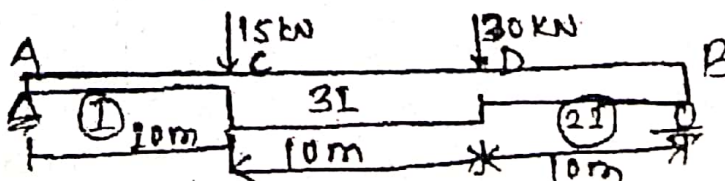


Fig. 2[b]

Contd. ...

- 3/ (2) Determine the maximum forces in the members U_2U_3 , L_3U_3 and L_3L_4 of the bridge truss shown in figure 3. If a udl of 50KN/m longer than the span traverses along the bottom of the chord members.

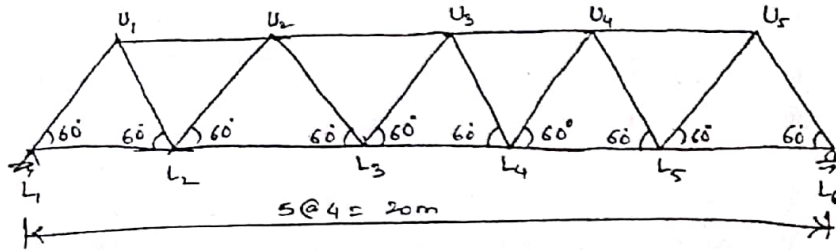


Fig. 3(b)

- 4(a) A train of 5 wheel loads crosses a simply supported beam of span 24m from left to right. Calculate the maximum positive and negative shear force values at the centre of the span and the absolute maximum bending moment anywhere in the span.

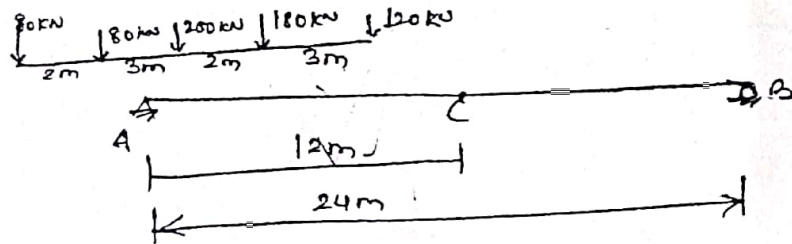


Fig. (4)

- (b) A rectangular beam $200\text{mm} \times 100\text{mm}$ is freely supported over a span of 2m . A load of 10KN is dropped on the middle of the beam from a height of 50mm . Find maximum instantaneous deflection and stress induced in the beam. Take $E = 101 \times 10^3 \text{ N/mm}^2$.
- 5(a) Derive moment area theorems.
- (b) A three hinged circular arch hinged at the spring and crown points has a span of 50m and a central rise of 8m . It carries a udl of 20KN/m over the right half of the span together with a concentrated load of 100KN at the left quarter span point. Find

(3) the reaction at the supports, normal thrust, shear and moment at section 25m from the left support.

- 6(a) Describe the load transfer mechanism in suspension bridge.
- (b) A foot bridge of width 3m and span 60m is carried by two cables of uniform section having central dip of 5m . If the platform load is 4KN/m^2 , calculate the maximum pull in each cable due to this load. What will be the central dip in each cable if a single count rated load of amount equal to total platform load as above acts at the centre of each cable instead of having bridge? Neglect self-weight of the cables.

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PURBANCHAL UNIVERSITY

2013

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BEG265CI: Theory of Structure-I

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Answer FIVE questions. Assume necessary data if required.

1. Determine vertical deflection of point D if truss is loaded as shown in fig. 1. If member AB & BC are subjected to rise in temperature of 25°C & member BD is 2mm too long. Cross section area of each member is 10cm^2 . $E=2 \times 10^5 \text{N/mm}^2$, $\alpha=12 \times 10^{-6}/^{\circ}\text{C}$

16

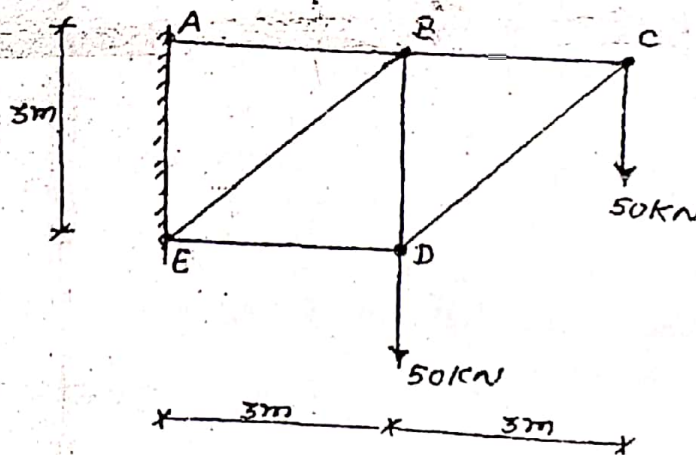


Fig. (1)

- 2(a) Find instantaneous maximum deflection & bending strain for 100×100 mm simply supported beam of 2m span when 400N weight falling from height of 100mm struck at mid span of beam. Take $E = 2 \times 10^5 \text{N/mm}^2$.

8

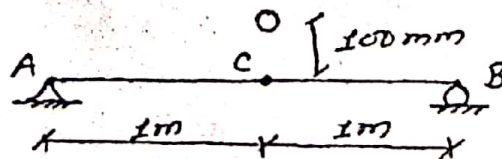


Fig 2(a)

Contd. ...

(2)

- (b) Using influence line diagram find maximum SF & B.M at point C when moving UDL travel through Beam. 8

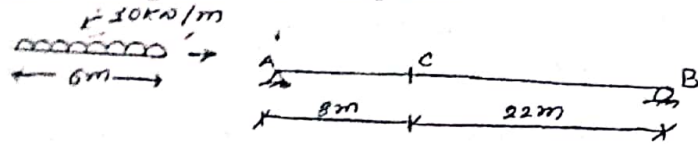


Fig. 2[b]

- 3(a) Explain principal of virtual work. 4

- (b) Determine the slope at A at deflection at C using integration method provided that the size of beam is 200mm by 200mm. Take $E = 2 \times 10^5 \text{ N/mm}^2$

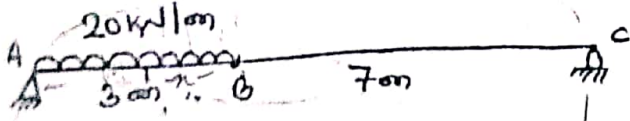


Fig. 3(b)

4. Draw Influence line diagram of member U_2-U_3 , L_3-L_4 & U_3-L_3 of truss given below in fig [4].

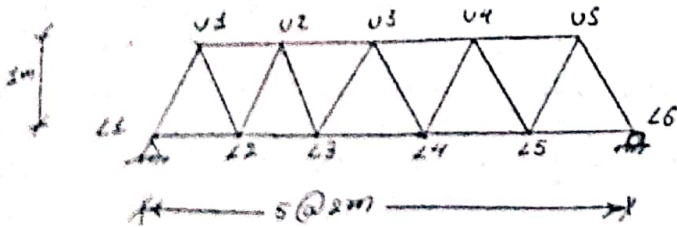


Fig. (4)

Determine force in member U_2-U_3 if UDL 10 kN/m & 2 m long travel through truss. 16

- a) List the difference between beam & Arch. 4
 b) Determine normal thrust, radial shear & BM at 5 m from left of parabolic given below. 12

Contd. ...

(3)

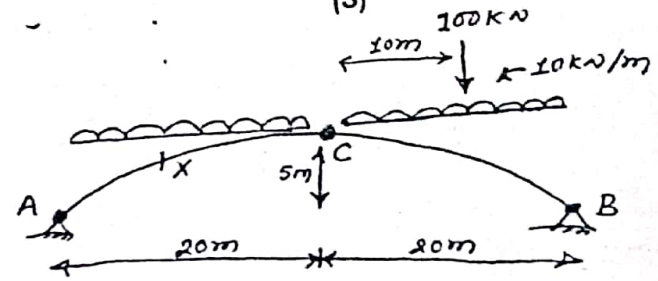
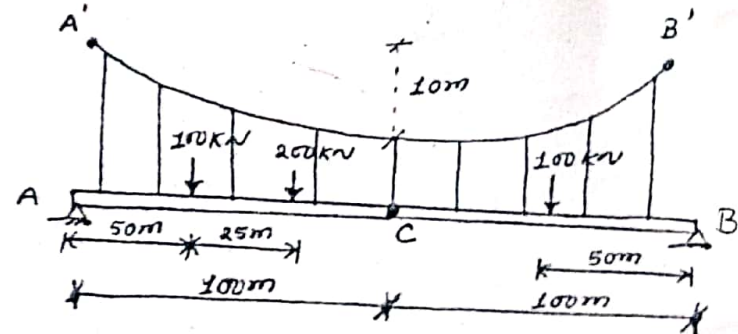


Fig. 5 [b]

- 6(a) A suspension bridge with three linged stiffening girder having span of 200 m & central dip 10 m ; loaded as shown in fig [6]. Calculate maximum tension in cable & bending moment at each load point.



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PURBANCHAL UNIVERSITY

2012

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BEG257CI: Theory of Structure-I

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Answer FIVE questions. Assume necessary data if required.

1. Determine the Vertical deflection of a point C if the truss is loaded as shown in Fig.1. If the member CD and DE are subjected to temperature fall of 20°C than other members, find the total deflection. The cross-sectional area of diagonal, horizontal and vertical members is 5cm^2 , 12cm^2 and 16cm^2 . Take $E=20.7 \times 10^3 \text{ kN/cm}^2$, $\alpha=12 \times 10^{-6}/^{\circ}\text{C}$. (16)

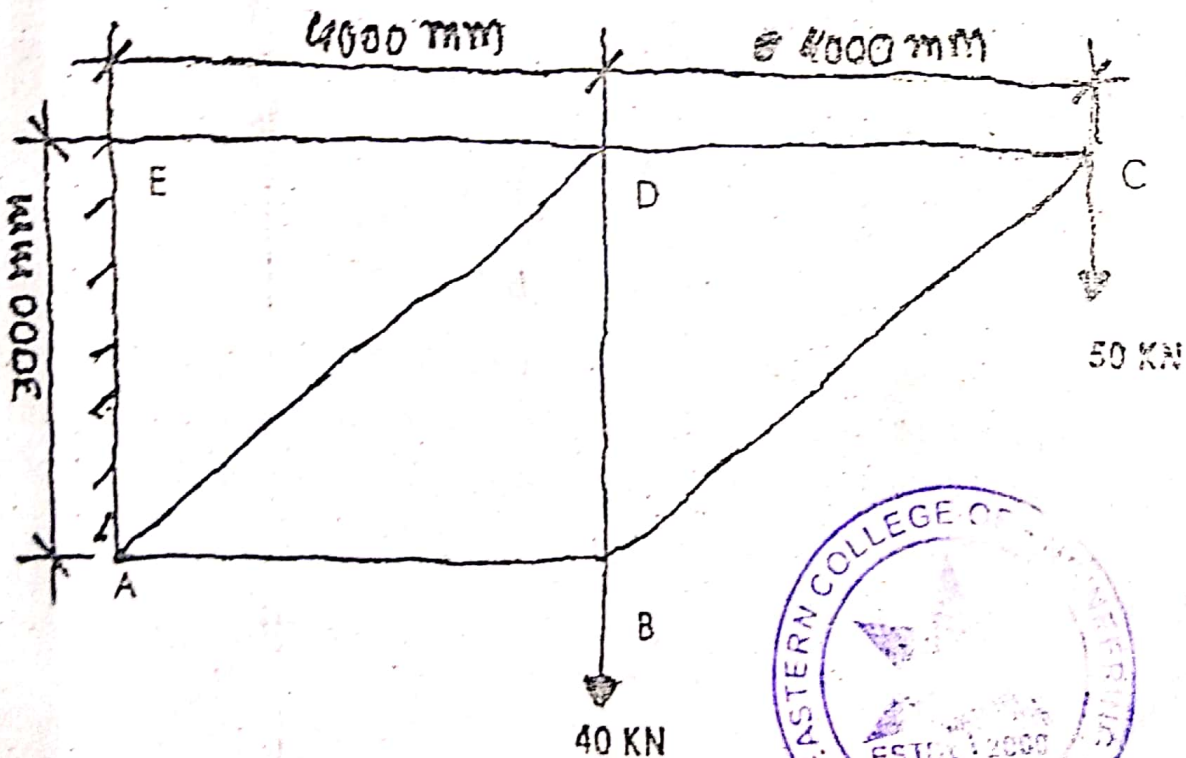


Fig. (1)

- 2(a) Explain difference between real and virtual work with sketches. 4 (2)

(2)

(b) Find the instantaneous maximum deflection and bending stress for the 50mm×50mm steel beam of 2m span and simply supported when struck at the mid span by a 300N weight falling from a height of 150mm above the top of the beam. Take $E=200$ GPa. Also find the maximum deflection and bending stress when the same load is suddenly applied. (12)

3(a) Explain the integration method of finding the slope and deflection. 4

(b) Using Conjugate beam method, compute the deflection at points A and C (Mid-span) and slope at D in the beam shown in Fig. 3(b). Take $E=$ Constant. 12

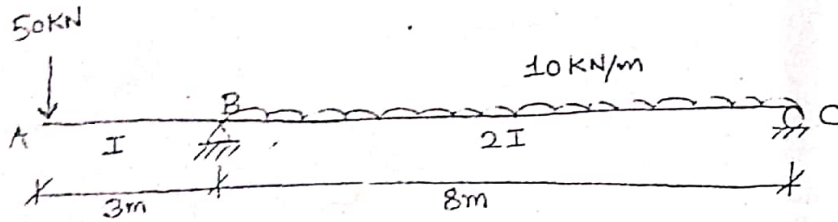


Fig. 3(b)

4. Determine the maximum forces in the members U2-U3, U2-L4 and L3-L4 of the bridge truss shown in Fig. (4). If a udl of 60kN/m longer than the span traverses along the bottom of the chord members. 16

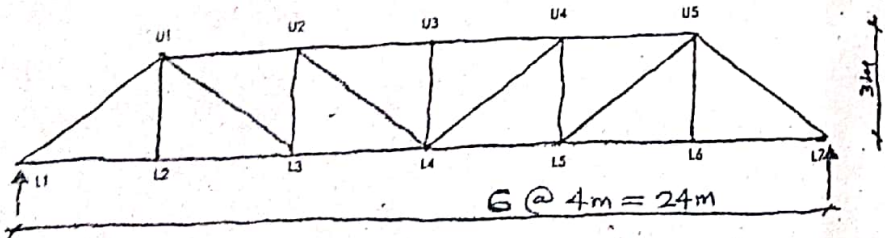


Fig. (4)

Contd. ...

(3)

5. A parabolic arch hinged at springing and crown has a span of 20m. The central rise of the arch is 4m. It is loaded with a uniformly distributed load of 3kN/m on the left 8m length. Calculate: (16)

- (a) The direction and magnitude of reaction at the hinge.
- (b) The BM, normal thrust and shear at 4m from the left end.
- (c) Maximum positive and negative bending moment.

6(a) Explain the difference between arch and beam.

(b) The cables of a suspension bridge have a span of 100m and central dip of 10m. Each cable is stiffened by a girder hinged two ends and at mid-span. The dead load is a uniform distributed load of 10 kN/m for the entire span. The live load is a uniformly distributed load of length of 20m and of intensity 30kN/m. Determine the maximum tension in the cable when the live load is placed on the left half of the span with its leading edge at the central hinge. Determine the bending moment and shear force in the girder at 25m from left support.

$$T_{max} = \sqrt{(V_B)^2 + (H)^2}$$

$$= \frac{70}{80}$$

PURBANCHAL UNIVERSITY

2018

B. E. (Civil)/Fourth Semester/*Final*

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG296MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FIVE questions.

5×8=40

1. ✓ What are the characteristics of scientific research and its significance? Distinguish between quantitative and qualitative data with suitable examples. 4+4
2. ✓ You are selected for field visit in the recently flood hit areas. What kind of preparation will you do? Explain. Also, define field work and its characteristics. 4+2+2
3. ✓ What is research design? Explain the concept of descriptive, correlational and qualitative research design. 2+2+2+2
4. ✓ What is report writing? Discuss the elements of report writing. 2+6
5. ✓ Define observation method of data collection. Explain in brief about its characteristics, merits and demerits. 2+6
6. Write short notes on any TWO: 4+4
 - (a) Testing of hypothesis
 - (b) Validity
 - (c) Standard deviation

≡

Maddy

PURBANCHAL UNIVERSITY

2017

B. E. (Civil)/Fourth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 / Pass Marks: 16

BEG296MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FIVE questions.

5×8=40

- ✓ 1. What do you mean by Research? Describe different phases of Research. 2+6
- ✓ 2. What is primary data? Compare and contrast between Interview and questionnaire method of data collection. 2+6
- ✓ 3. What do you mean by research Design? Discuss any four types of research design. 3+5
- ✓ 4. What are benefits of sampling? Explain different types of Probability Sampling. 2+6
5. Define Report? How will you present Tables, figures and graphs in the Report? 2+6
- ✓ 6. Write short notes on any TWO: 4+4
 - (a) Testing of hypothesis
 - (b) Standard deviation and mean
 - (c) Applied research

Simple
systematized
cluster

Stan

PURBANCHAL UNIVERSITY

2016

B. E. (Civil)/Fourth Semester/*Final*

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG296MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer ALL questions.

5×8=40

1. Define social research. Discuss about phases on social research. 3+5
2. What is the role of data collection in social science research? Distinguish between primary and secondary sources of data. 4+4
3. Differentiate between applied and fundamental research with examples. 8

Or

What is meant by research problem? What are some main steps to be considered to prepare it? 3+5

4. What is Hypothesis? Discuss the types of hypothesis with suitable example. 3+5

Or

What is the significance of a report to an engineer? Give a format of a report which is commonly used in University. 4+4

5. Write the objective and importance of sampling in research. Also discuss the probability sampling used in research. 4+4

Or

What are the basic five steps of research design? Write briefly about them. 8

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PURBANCHAL UNIVERSITY

2016

B. E. (Civil)/Fourth Semester/*Final*

Time: 01:30 hrs.

Full Marks: 40 / Pass Marks: 16

BEG296MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FIVE questions.

5×8=40

1. Differentiate between basic and applied research. Describe the process of the scientific research. 2+6
2. Define Research Hypothesis. Explain the different method of hypothesis formulation. 2+6
3. What is Research Design? Describe various types of research design. 2+6
4. What is sampling? Discuss the different types of sampling. 2+6
5. What do you understand by a Research Report? Explain the general procedures to be followed while preparing a research report. 2+6
6. Write short notes on any TWO: 4+4
 - (a) Reliability
 - (b) Difference between quantitative and qualitative data
 - (c) Research Proposal

1. *critically*

PURBANCHAL UNIVERSITY

2015

B. E. (Civil)/Fourth Semester/*Final*

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG296MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FIVE questions.

5×8=40

1. Define scientific research. What are the objectives of scientific research?
2. What is sampling? Describe the various types of sampling.
3. Explain how research proposal should be prepared and presented.
4. What is research design? Discuss various elements of research design.
5. What do you mean by research report? Discuss the need and methods of present footnotes in report.
6. **Write short notes on any TWO:**
 - (a) Standard Deviation
 - (b) Field Work
 - (c) Questionnaire



PURBANCHAL UNIVERSITY

2014 (New)

B. E. (Civil)/Fourth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 / Pass Marks: 16

BEG296MS: Research Methodology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1. ✓ Discuss the different phases of social research. 8
2. ✓ What is hypothesis? Discuss different type of hypothesis with examples. 2+6
3. ✓ What is research design? Describe the different type of research design. 2+6
4. What is data? Distinguish between primary data and secondary data. Also discuss the various method of collecting primary data. 2+2+4
5. ✓ What do you understand by report writing? Explain the general procedures to be followed in operating a research report. 2+6
6. Write short notes on any TWO: 4×2 =8
 - (a) Bibliography
 - (b) Case Study
 - (c) Reliability and validity

029/02/31

PURBANCHAL UNIVERSITY

2013

B.E. (Civil/Computer/Electronics & Comm.)/Sixth Semest./Final
Time: 01:30 hrs. Full Marks: 40/Pass marks: 15
BEG396MS: Research Methodology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5×8=40

1. What are the quality of a good research and explain briefly about the steps which are required to carry out for any research work.
2. Explain the different types of sampling method and write some precaution which should be taken before carry out the sampling
3. What is research proposal? Write the elements of research proposal and also explain the procedure while selecting research topic.
4. Write different technique for primary data collection and also compare the method of interview and questionnaire for collecting data according to their merits and demerits with appropriate examples.
5. Write the source of data and also explain, with example, the necessary caution while collecting and using secondary data for research.
6. How can you process and analyze the data? List the methods of presentation of data.
7. Write short notes on any TWO:
(a) Research Report
(b) Hypothesis
(c) Case Study

PURBANCHAL UNIVERSITY

2013

B. E. (Civil)/Fourth Semester/Final
Time: 01:30 hrs. Full Marks: 40 /Pass Marks: 15
BEG396HS: Research Methodology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1. Differentiate between Reliability and validity of scale. What are methods of measure of Validity and Reliability?
2. What is Research Hypothesis? What are the criteria of research hypothesis? What do you know about topic selection research?
3. What is research Design? What are the objectives of research design? Describe the different types of research design.
4. Discusses the significance of Social Research in engineering, appropriate examples. Discuss about steps of social Research.
5. What do you understand by a Research reports? What are steps that generally follows in the academic research.
6. Define Sampling and Census. Write the application of Probabilistic sampling while doing civil engineering projects.
7. Write short note on any TWO:
(a) Data Interpretation & Analysis
(b) Survey method of data collection
(c) Field work
(d) Applied Research

Maddy

PURBANCHAL UNIVERSITY

2018

B. E. (Civil)/Fourth Semester/*Final*

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG210AR: Fundamentals of Architecture (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FIVE questions.

5×8=40

1. Define architecture. Explain with example on "architecture as mother of all arts." 4+4
2. Explain design process and its importance. Explain design process of residential building. 3+5
3. What is Planning? Discuss about the objectives aims and principles of urban planning? 1+7
4. What is conservation? Explain about the spatial composition of buildings giving suitable examples?? 1.5+6.5
5. Elaborate the importance of thermal insulation in building? Also, mention the types of residential and public buildings. 4+2+2
6. Write short notes on any TWO: 4+4
 - (a) Airport
 - (b) Form remains, function never dies
 - (c) Egyptian civilization



PURBANCHAL UNIVERSITY

2017

B. E. (Civil)/Fourth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG210AR: Fundamentals of Architecture (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FIVE questions.

5×8=40

1. "Architecture is a creative art". Explain this statement. What are the bases for development of architecture? 4+4
2. "Building design is the result of systematic design process". Explain this statement with supportive sketches. 8
3. Classify the types of building according to the function. Also give the sketch of any residence. 2+6
4. Define urban planning. What are the principles of urban planning? 2+6
5. Explain the importance of sound insulation in building. Explain different types of sound -insulation measures in the building. 2+6
6. Write short notes on any TWO: 4+4
 - (a) Kindergartens
 - (b) Railway Station
 - (c) Supermarket



PURBANCHAL UNIVERSITY
2016

(Civil)/Fourth Semester/*Final*

01:30 hrs.

Full Marks: 40 /Pass Marks: 16

CG210AR: Fundamentals of Architecture (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FOUR questions.

4×10=40

1. Define architecture in detail. How do you define as "Architecture as mother of all arts"? 5+5
2. Explain briefly about the types of residential and public buildings. 5+5
3. Explain briefly about the objectives and principles of urban planning. What is Environmental Impact Assessment (EIA)? 8+2
4. Explain design process of residence. Also make a sketch of any residence building. 5+5
5. Write short notes on any TWO: 5+5
 - (a) Thermal Insulation in a building
 - (b) Construction systems used in buildings
 - (c) Architectural conservation



PURBANCHAL UNIVERSITY

2016

B. E. (Civil)/Fourth Semester/*Final*

Time: 01:30 hrs.

Full Marks: 40 / Pass Marks: 16

BEG210AR: Fundamentals of Architecture (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FIVE questions.

5×8=40

- 5 ✓ 1. State the basic techniques of architectural development and also explain them. 8
- 2 2. Explain about the construction system of building in Nepal. 8
- 2 3. What are the modern technologies of architectural designing in Nepal? Explain. 8
- 3 4. What are the basic principles of urban planning? Explain. 8
- 1 ✓ 5. Define form and function. Explain the volumetric and spatial composition of building. 2+6
- 2 6. Write short notes on any TWO: 4+4
 - 3 (a) Light
 - ✓ (b) Kinder Gardens
 - (c) Railway Stations
 - (d) Sport Complex



PURBANCHAL UNIVERSITY

2015

B. E. (Civil)/Fourth Semester/*Final*

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG210AR: Fundamentals of Architecture (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

5×8=40

Answer ALL questions.

1. What is Architecture? What is its importance in society? Explain about the development of Architecture in terms of material, technology and socio-cultural factors.

Or

What are the functional classifications of buildings? Explain with its basic standards.

2. Define Urban Planning. What are the aims and objectives of urban planning? Explain its impact on environment.

Or

What are the important factors to be considered to design building? Draw a bubble diagram of a residential building with parking area.

3. Define acoustic treatment in the building. What are the materials used for acoustic treatment?
4. What are the principles used in architectural design? Explain with sketches.
5. Write short notes on any TWO:
 - (a) Thermal insulation
 - (b) Supermarket
 - (c) Auditorium

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PURBANCHAL UNIVERSITY

2014 (New)

B. E. (Civil)/Fourth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG210AR: Fundamentals of Architecture

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FOUR questions.

Compare and contrast between any TWO the following: 5+5

- (a) Bubble diagram and flow chart
- (b) Load Bearing and framed buildings
- (c) Residential and public building

Explain building design as a process. 10

Define architecture. Discuss the tendencies of development of architecture in brief. 2+8

What are the elements of design? Explain the ordering principles used in architectural design. 2+8

Write short notes on any TWO: 5+5

- (a) Form and function
- (b) Urban planning and its objectives
- (c) Architecture as mother of all arts

≡



PURBANCHAL UNIVERSITY

2013

B. E. (Civil)/Fourth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG212AR: Fundamentals of Architecture

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FOUR questions.

1. Explain, what is architecture and factors influencing its development? 3+7
2. Explain, in brief, the processes involved in designing a building. Illustrate with necessary sketches: 10
3. What are various construction systems? Explain modern technologies in practice. 4+6
4. What are objectives and principles of Urban Planning? Explain its importance in the context of Nepal. 10

OR

What is thermal comfort in building? Explain, with sketches, the details of thermal insulation in openings and roof. 4+6

5. Why architecture is called mother of all arts? Elucidate the fact. 10
6. Write short notes on any TWO: 5+5
 - (a) Volumetric and spatial composition
 - (b) Residential building
 - (c) Bazaar
 - (d) Airport

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Set. 1999

PURBANCHAL UNIVERSITY

2018

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG203SH: Probability & Statistics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. Necessary statistical tables are allowed.

Group A

Answer FOUR questions.

4x(4+6)=40

1(a) The IQ score of students in an IQ test is given below.

IQ Scores	10-20	20-30	30-40	40-50	50-60
No. of students	20	25	30	12	7

- (i) Construct histogram (ii) Construct frequency polygon
(iii) Locate mode of the distribution

(b) The arithmetic mean and standard deviation of 10 items are 60 and 10 respectively. In the process of calculation, it was found that an item 59 was incorrectly included as 99. Find the correct mean and correct standard deviation.

2(a) A sample of 50 cars of 2 manufactures X and Y-is taken and average life in years is recorded

Life in years	No. of cars	
	Manufacture X	Manufacture Y
0-5	8	6
5-10	12	10
10-15	17	20
15-20	10	12
20-25	3	2

Which of these manufactures shows greater consistency in performance.

(b) A random variable X has the following probability distribution:

X	0	1	2	3	4	5	6	7
P(x)	k	2K	3k	uk	3k	2k	2k	k

Contd. ...



(2)

Find,

- (i) the value of k,
- (ii) mean of x;
- (iii) variance of x.

- 3(a) Differentiate between correlation and regression.
- (b) Obtain the equation of two lines of regression for the following data. Also estimate the most likely marks in statistics when the marks of Physics is 30.

Marks in Physics	25	28	35	32	31	36	29	38	34	34
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

- 4(a) The probability that A can solve a problem is $2/5$ and probability that B can solve the same problem is $3/7$. If the problem is given to both, find the probability that the problem remains unsolved.
- (b) State and prove Baye's theorem of Probability.
- 5(a) Define Poisson distribution and hence find its mean and variance.
- (b) Five unbiased coins are tossed together. Find the probability of getting.
- (i) exactly one head
 - (ii) no head
 - (iii) at least 3 heads
 - (iv) at most 2 heads

Group B

4x(4+6)=40

Answer FOUR questions.

- 6(a) What do you understand by point estimate and interval estimate? Discuss the properties of a good estimator. 4
- (b) A sample of 400 students taking entrance examination of B.E. revealed as average score of 56 and sample standard deviation of 10. Construct a 95% and 99% confidence interval for the population mean.
- 7(a) Define Normal Distribution. What are the properties of Normal distribution? 4
- (b) Students are given a test in statistics. The marks obtained by students are normally distributed with mean marks is 70 and standard deviation of 10. Find the probability of getting.

(3)

- (i) more that 60 marks
- (ii) between 50 and 80 marks
- (iii) more than 80 marks
- (iv) less than 75 marks.

- 8(a) What are null and alternative hypothesis? Describe the errors hypothesis testing?
- (b) In marketing survey, 192 out of 400 consumers responded the product was good. After a change in specification, again survey was done and found that 220 out of 400 consumers responded as the product was even better than before. Can we conclude that the proportion of consumers responding good the product increased afterward? Test at 2% level of significance.
- 9(a) What do you mean by t-test? What are the assumptions and properties of t-test?
- (b) Memory capacity of 10 students was tested before and after training. State whether the training was effective or not from following scores at 5% level of significance?

Roll No.	1	2	3	4	5	6	7	8	9	10
Before training	12	14	11	8	7	10	3	0	5	6
After training	15	16	10	7	5	12	10	2	3	8

- 10(a) Write down the steps for chi-square test for goodness of fit.
- (b) A sample of 500 workers of factory according to gender and nature of work is as follows.

Nature of work	Gender		Total
	Male	Female	
Technical	200	100	300
Non-technical	50	150	200
Total	250	250	500

Test at 5% level of significance whether there exists relationship between gender and nature of work.

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PURBANCHAL UNIVERSITY

2017

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG203SH: Probability & Statistics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. Necessary statistical tables are allowed.

Group A

Answer FOUR questions.

4x(4+6)=40

1(a) Distinguish between central tendency and dispersion. 4

(b) The score of two batmen A and B in ~~10~~ ¹⁰innings during a certain match are as follows: *Who is more consistent bat (6) man*

A	32	28	47	63	71	39	10	60
B	19	31	48	53	61	90	10	62

2(a) State and prove addition law of probability. 4

(b) A bag contains 4 red and 5 black balls. Two balls are drawn at random with replacement. Find the probability of getting (i) both red balls (ii) first red and second black ball (iii) first black and second red ball (iv) both black balls. 6

3(a) Define the Karl Pearson correlation coefficient and mention its basic properties. 1+3

(b) A sample of 12 fathers and their eldest son gave the following data about their heights in inches. 6

Father	65	63	67	64	68	62	70	66	68	67	69	71
Son	68	66	68	65	69	66	68	65	71	67	68	70

Estimate the regression line to estimate of Son's height for a given height of Father and estimate the height of Son whose Father's height is 69 inches

4(a) State the condition of application of Poisson probability distribution. Also define this distribution. 1+2

370/56

Contd. ...

(2)

(b) Fit the Poisson distribution to the following data of daily number of power failures reported in a Kathmandu valley on 300 days. 6

Number of power failure	Number of days
0	9
1	43
2	64
3	62
4	42
5	36
6	22
7	14
8	6
9	2

$\frac{1}{6}$

$\frac{1}{x_i}$

$\frac{50}{10}$

5(a) Define random variable and mathematical expectation of a random variable. 4

(b) Find the mathematical expectation and variance of sum of numbers obtained in a throwing of two dice. 6

Group B

Answer FOUR questions.

4*(4+6)=40

6(a) Define the Standard Normal distribution. Write down the important properties of Standard Normal distribution. 4

(b) In an examination conducted to check the performance of students it is assumed that the mark follow the Normal distribution. If seven percent of the students get marks less than 35 and 89 percent of the students get marks fewer than 63. Find the mean and the standard deviation of the distribution of marks. 6

7(a) Describe estimation and its types. 4

(b) In 39 soil samples tested for trace elements, the average amount of copper was found to be 22 milligrams, with a variance of 16 milligrams. Find (i) 95% and (ii) 99% confidence interval for the true mean copper contents in the soil from which these samples were taken. 6

8(a) What are the fundamental steps of test of significance of difference of proportion when the sample size is large? 4

(3)

(b) The breaking strength of cable produced by a manufacturer, using a mean of 1800 pounds and standard deviation of 100 lbs. A new technique in the manufacturing process, it is claimed that the breaking strength can be increased. To test this claim, a sample of 50 cables is tested and it is found that the breaking strength is 1850 lbs. can we support the claim at 0.01 level of significance?

9(a) What are the steps for paired t-test?

(b) In a study of the effectiveness of physical exercise in a reduction a group of 16 persons engaged in a prescribed program of physical exercise for one month showed the following reduction in weight in pound?

Before	209	178	169	212	180	192	158	180	170	153	183	165	201	179	241
After	196	171	170	207	177	190	159	180	164	152	179	162	199	173	231

Use the 1% level of significance to test whether the program of exercise is effective.

10(a) Write down the steps for chi-square test for goodness of fit

(b) Samples of 400 contracts were classified according to characteristics duration of contract and type of industry as following two way table.

Types of Industry	Duration of Contact		
	2 years or less	3 years	4 year or more
Manufacturing	10	187	48
Non manufacturing	13	107	35

Does the duration of a contract depend on the type of industry? Answer by using a test for independence with level of significance 5% level of significance.

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PURBANCHAL UNIVERSITY

2016

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG203SH: Probability & Statistics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. Necessary statistical tables are allowed.

Group A

Answer **FOUR** questions.

4×(4+6)=40

- 1(a) Prepare a histogram for the following data of height of plants given below.

Height (cm)	10-20	20-30	30-50	50-65	65-80	80-100
No. of plant	12	16	42	45	36	9

Also locate the value of Mode on the histogram.

- (b) The score obtained by two groups of students in an entrance examination is given below. If consistency in the marks helps to teach in the class room, suggest which class is easier to teach and why?

Class A	84	56	69	75	91	55	49	65	58	82
Class B	75	65	55	56	68	84	67	88	76	88

- 2(a) Define Karl Pearson correlation coefficient and write down its basic properties.

- (b) Find the most likely price in market A corresponding to the Price of Rs. 75 at market B from the following data:

Average Price in Market A= Rs. 67

Average Price in Market B= Rs. 65

Coefficient of Variation in Market A= 5.22%

Coefficient of Variation in Market B= 2.85 %

The coefficient of correlation between them= 0.82

- 3(a) Define the terms mutually exclusive Events and Classical definition of probability.

Contd. ...

(2)

- (b) A problem is given to three students A, B and C whose chance of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. Find the probability that the problem will be solved.
- 4(a) Define and compare probability mass function and probability density function.
- (b) Let X be a random variable with $f(x) = \begin{cases} ke^{-2x}, & 0 \leq x < \infty \\ 0, & \text{otherwise} \end{cases}$. Find the value of K and by using this value of K find the mean and variance of random variable.
- 5(a) Define Binomial Distribution and Hyper-Geometric distribution with their respective probability mass function.
- (b) If the probability of a bad reaction from a certain injection is 0.001. Determine the chance that out of 200 individuals.
- More than two will get a bad reaction
 - Exactly two will get a bad reaction
 - At least two will get a bad reaction

Group B

Answer FOUR questions.

4×(4+6)=40

- 6(a) Define Normal distribution and write down basic properties of it.
- (b) The mean inside diameter of a sample of 200 washers produced by a machine is 0.502 cm and the standard deviation as 0.005 cm. Determine the percentage of washers whose inside diameter:
- between 0.496 cm and 0.508 cm,
 - more than 0.55 cm,
 - less than 0.49 cm.
- 7(a) Define census and sampling method. Also define population parameter and sample statistics.
- (b) A sample of 100 engineers from small construction companies and a sample of 100 engineers from large construction companies were interviewed about having expense controls in place for use of cellular phones. Of the small companies, 47 had controls in place whereas 79 of the large companies had controls. Determine the 94% confidence limits in population proportion in expense controls in place for large and small companies' engineers.

(3)

- 8(a) Define Hypothesis and type of error occurred in the decision making based on sample.
- (b) A random sample of 200 bolts manufactured by machine A and 100 bolts manufactured by machine B showed 19 and 12 defective bolts respectively. Test the hypothesis that machine B is performing better than A at 5% level of significance.
- 9(a) Write down the steps of test of significance of pair t-test.
- (b) The following table presents the numbers of guest registered on 27 randomly selected days in a hotel at Kathmandu. Calculate the sample mean, standard errors of mean. Test the hypothesis that the mean number of Guest registered in Hotel 60 or more.

61	57	53	60	64	57	54	58	63
61	50	59	50	60	57	58	62	63
60	54	54	61	51	53	62	57	60

- 10(a) Write down the steps involved in the test of significance of independence of categorical variable.
- (b) A Campus newsletter polls a random sample of undergraduate students' counts regarding a proposed change in library regulations and obtains the following frequency.

Students	Responses		
	Favour	Indifference	Oppose
Male	93	72	21
Female	55	79	30

Does the proposal seem to appeal differently to male and female students test with 5% level of significance?

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PURBANCHAL UNIVERSITY

2016

B. E. (Civil)/Fourth Semester/*Final*

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG203SH: Probability & Statistics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. Necessary statistical tables are allowed.

Group A

Answer FOUR questions.

$4 \times (4+6) = 40$

1(a) The combined mean and variance of salary of 250 workers of city A and B taken together are 560 and 5497 respectively. The mean and variance of the salary of 150 workers of city B are 500 and 81 respectively. Find the Variance of salaries in city A

(b) The expenditure of 1000 families is given as below:

Expenditure	40-59	60-79	80-99	100-119	120-139
No. of families	50	-	500	-	50

The median of the frequency distribution is Rs. 87. Calculate the missing frequencies.

2(a) What do you understand by correlation and regression? ~~Mention~~ the properties of regression coefficient.

(b) Find the Karl Pearson's correlation coefficient from the following data points:

Advertisement cost (in lakh)	2	5	10	12	15	20
Sales (in crores)	50	58	60	67	70	80

3(a) Define conditional probability. State and prove addition law of probability.

(b) A bag contains 4 red, 5 black and 6 white balls. Three balls are drawn at random. Find the probability of getting (i) 3 red ball, (ii) 3 black balls and (iii) one ball of each color.

4(a) What do you understand by random variable and mathematical expectation of a random variable.

Contd. ...

(2)

- (b) Determine the mathematical expectation of sum of numbers obtained in a throwing of two dice.
- 5(a) Write down the basic properties of binomial Distribution and Prove that mean of this distributing is 'np'.
- (b) Test for impurities commonly found drinking water from private wells showed that 30% of all wells in a particular have impurity A. If a random sample of 5 wells is selected from the large number of wells in the country, what is the probability that:
- Exactly 3 wells have impurity A?
 - At least 3 wells have impurity A?
 - Fewer than 3 wells have impurity A?

Group B

answer FOUR questions.

4×(4+6)=40

- 5(a) Define normal distribution: Mention the properties of normal distribution.
- (b) A sample of 600 Mobile of a certain Brand are tested to find the length of Battery After each full charge, produced result of average 12 hours and standard deviation of 4.5 hours. Assuming the data to be normally distributed, find the number of mobiles that are expected to have life after each full charge: (i) more than 15 hours, (ii) between 10 and 14 hours, (iii) less than 8 hours.
- 7(a) What do you understand by estimation? Describe point estimation and interval estimation with example.
- (b) A random sample of 700 units from a large consignment showed that 200 were damaged. Find: (i) 95% and (ii) 98% confidence limits for the proportion of damaged units in the consignment.
- 8(a) Which test is use to test the significance of difference of two proportion, discuss the test with suitable steps.

(3)

- (b) The average hourly wage of a sample of 150 workers in City A was Rs. 25.6 with a standard deviation of 10.8. The average hourly wage of a sample of 200 workers in City B was Rs. 28.5 with a standard deviation of Rs 12.8. Can an applicant assume that the hourly wage paid in City B is higher than that paid in City A.
- 9(a) Write down the steps of test of significance of single mean for small sample and mention the formula for the confidence interval for the same.
- (b) The average life of 10 houses is 88 years and standard deviation is 10 years. Test the hypothesis that the average life of houses is 90 years. Use 5% level of significance.
- 10(a) Write down the steps involved in Chi-square test for goodness of fit.
- (b) All together 1,072 damaged household of a city of 'earthquake 2072' are classified according to their Number of floor and Damage conditions. Test whether there is any association between Damage condition of building and number of floor for this earthquake.

Damage condition	Number of floor			
	One	Two	Three	More than Three
Yellow	48	199	181	82
Red	81	185	190	106

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PURBANCHAL UNIVERSITY

2015

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG203SH: Probability & Statistics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. Necessary statistical tables are allowed.

Group A

Answer FOUR questions.

$4 \times (5+6) = 44$

1(a) What is central tendency? Compute the median wage from the following data:

Wages (in Rs.)	Below 40	40-60	60-80	80-100	100-120	120-140	Above 140
No. of workers	4	6	10	16	12	7	3

(b) Find standard deviation and coefficient of variation of breaking strength of 80 test pieces of certain alloy from the following table:

Breaking strength	40-42	42-44	44-46	46-48	48-50
No. of pieces	5	15	24	20	12

2(a) What is meant by trial and event? Discuss equally likely, mutually exclusive and exhaustive events with examples.

(b) Given that $P(A) = 3/8$, $P(B) = 5/8$ and $P(A \cup B) = 3/4$, find $P(A/B)$ and $P(B/A)$. Show whether A and B are independent.

3(a) Define probability distribution of a random variable. Determine the probability distribution of number of heads in a throwing of three coins.

(b) Find the expected value and variance of the following probability distribution:

X	-10	-20	30	75	80
P(x)	1/5	3/20	1/2	1/10	1/20

4(a) Show that the mean of binomial distribution is np and variance is npq .

Contd. ...

(2)

- (b) The number of accidents in a year attributed to taxi drivers in a city follows Poisson distribution with mean 3. Out of 1000 taxi drivers, find approximately the number of drivers with (i) no accidents in a year, and (ii) more than 3 accidents in a year.
- 5(a) What is normal distribution? Discuss the properties of normal distribution.
- (b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

Group B

Answer THREE questions.

3×(6+6)=36

- 6(a) Define the term statistic and parameter. Discuss the properties of good estimator.
- (b) A random sample 100 items taken from a large batch of articles contain 85 defective items. Determine the 95% and 98% confidence limits for the proportion of defective items in the batch.
- 7(a) What do you understand by testing of hypothesis? Discuss type I and type II error with example.
- (b) A sample of 900 members has a mean 3.4 cms and s.d. 2.61 cms. Can the sample be regarded as one drawn from a population with mean 3.25 cms?
- 8(a) Describe the procedure of testing paired t- test.
- (b) The sales data of an item in six shops before and after a special promotional campaign are as under:

Shops	A	B	C	D	E	F
Before campaign	53	28	31	48	50	42
After campaign	58	29	30	55	56	45

Can the campaign be judged to be a success? Test at 5% level of significance.

- 9(a) What is chi-square distribution? Discuss the conditions for applying chisquare test.
- (b) The equations of regression lines between two variables are expressed as $x+2y-5=0$, $2x+3y=8$ and $v(x)=12$. Find: (i) mean of x and y , (ii) r and (iii) $v(y)$.



(4)

	Region				Total
	NE	NW	SE	SW	
Purchase the brand	40	55	45	50	190
Donot purchase brand	60	45	55	50	210
	100	100	100	100	400

PURBANCHAL UNIVERSITY

2014 (New)

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG203SH: Probability & Statistics

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. Necessary statistical tables are allowed.

Group A

Answer FOUR questions.

4×10=40

1(a) What do you mean by measures of average? Write the properties of An Idal Average. 4

(b) Mr. Robert discovered the electron by isolating negatively charged particles for which he could measure the mass charge ratio. This ratio appeared to be constant over a wide range of experimental conditions and, consequently, could be characteristics of new particles. His observation from two different cathode ray tubes that used air as the gas: 6

Tube I	0.57	0.34	0.43	0.32	0.48	0.40	0.40
Tube II	0.53	0.47	0.47	0.51	0.63	0.61	0.48

Which tube is more consistent and why?

2(a) What are the properties of regression coefficients? 4

(b) Calculate Karl Pearson's coefficient of correlation between expenditure on advertising (Rs. '000) and sells (Lakh Rs.) from the data given below: 6

Ad. Expenses	39	65	62	90	82	75	25	98	36	75
Sales	47	53	58	86	62	68	60	91	51	84

3(a) Define the term Equall likely event. 4

The odds that a book probability and statistics will be favourable reviewed by 3 independent critics are 3 to 2, 4 to 3 and 2 to 3 respectively. What is the probability that of the three reviews, a majority will be favourable?

Contd. ...

(2)

(b) In a certain assembly plant, three machines A, B, and C make 30%, 45% and 25% respectively of the products. It is known that past experience that 2%, 3% and 2% of the products made by each machine respectively are defective. Now suppose that a finished product is randomly selected 6

- (i) What is the probability that it is defective?
- (ii) If a product were chosen randomly and found to be defective, what is the probability that it was made by Machine B.

4(a) What do you understand by random variable? What is the mathematical Expectation of a random variable? 2+2

(b) Following probability function is given for the discrete random variable X. 6

X	0	1	2	3	4	5	6
P(x)	k	6k	15k	20k	15k	6k	k

- (i) Find the value of constant k if p(x) is a probability mass function
- (ii) Find the mean number of variable and its variance.

5(a) What are the condition of application of Binomial and Poisson distribution? 2+2

(b) In proof testing of circuit board, the probability that any particular diode will fail is 0.002. Suppose a circuit board contain 2000 diodes. 6

- (i) What is the probability that no diode will fail? 0.721
- (ii) What is the probability that at least four diode will fail?
- (iii) What is the probability that at most three diode will fail?

Group B

Answer FOUR questions.

4x10=40

6(a) Define the Normal distribution, what are the chief characteristics of normal probability curve. 1+3

(b) An industrial engineer has found that the standard household light bulbs produced by a certain manufacturer have a useful life that is normal distributed with mean of 250 hours and a variance of 2500. What is the probability that a randomly selected bulbs from this production process will have a useful life. 6

Contd. ...

(3)

- (a) In excess of 300 hours
- (b) Between 190 and 270 hours
- (c) Not exceeding 200 hours

7(a) Define the terms Parameter and statistics. Also discuss standard error, Point estimator and interval estimator

(b) Hotel's manager in Kathmandu wants to know the average daily registration. The following table presents numbers of guest registered each of 27 randomly selected. Calculate the sample mean, standard errors of mean and confidence limits of population mean.

61	57	53	60	64	57	54	58	63
61	50	59	50	60	57	58	62	63
60	54	54	61	51	53	62	57	60

8(a) Define the term Statistical Hypothesis. What are the error arising during decision based on sampling? Discuss in brief.

(b) Consider the case of Pharmaceutical Manufacturing Co. testing two new compounds intended to reduce blood-pressure level. The compounds are administered two different laboratory animals. In groups A, 71 out of 100 animal response to drug first with lower blood-pressure levels. In B, 58 out of 90 animals tested respond to drug second lower blood pressure level. The company wants to test levels whether there is a difference between the efficiency of these two drugs.

9(a) What are the basic Assumption about test of significance single mean for small sample?

(b) Two independent samples of 8 and 7 items respectively having following values, whether these two samples are drawn from populations with equal mean. Test at 5% level of significance

Sample I	9	11	13	11	15	9	12	14
Sample II	10	12	10	14	9	8	10	

10(a) What are the applications of chi square distribution? Write the conditions of validity of chi square test of goodness of fit

(b) A brand manager is concerned that her brands share is unevenly distributed throughout the country. In a survey which the country was divided into four geographic regions random sampling of 100 consumers in such regions surveyed with the following results.

PURBANCHAL UNIVERSITY

2013

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG203HS: Probability & Statistics

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions, selecting at least FOUR from each Group. Necessary statistical tables are allowed.

Group A

1(a) Define the term Standard Deviation and its use in Engineering? 4

(b) Write the importance and application of statistics in the field of Civil Engineering. Following are the Duration in minutes that a student had to wait for a college bus go to College on 16 days: 6

13, 2, 11, 9, 5, 7, 8, 12, 14, 25, 17, 16, 8, 1, 10 and 15. (10.8), 47.18

Find the Mean and Variance of these data.

2(a) State and prove Bayes's Theorm of Probability. 4

(b) An insurance company insured 2000 Civil engineers, 4000 Electrical engineers and 6000 Mechanical engineers working in Hydro power sector. The probability of an accident involving Civil engineer, Electrical engineer and Mechanical engineer during their jobs is 0.01, 0.03 and 0.15 respectively. One of the insured engineers meets with an accident. What is the probability that he is civil engineer? 6

3(a) Define Probability mass function and probability density function in brief. 2+2

(b) A random variable X has the following probability function:

X	1	2	3	4	5	6	7
P(x)	k	2k	2k	3k	k ²	2k ²	7k ² +k

3.66

3.404

Find mean and variance of random Variable X.

6

Contd. ...

(2)

4(a) Define Binomial distribution and Negative Binomial Distribution. What are the basic assumptions of Poisson distribution? 2+2

(b) A certain screw making machine produces on an average 4 percentage of defective screws. These screws are packed in boxes of 500. Find the probability that: 6

- (i) A box contains 15 defective screws. 7.19×10^{-5}
- (ii) A box contains no defective screws. 2.06×10^{-9}
- (iii) A box contains at least five defective 0.99

5(a) Define the term Karl Pearson correlation coefficient. Mention its properties. 4

(b) Find out the Regression line of dependent variable Y on Independent variable X. Also estimate the Value of Y when the value of X is 290. 6

X	115	22	148	251	83	47	325	92	70	164
Y	84	385	200	110	292	152	86	120	321	144

$b_{yx} = -1.32$
 $y = -19.69$

Group B

6(a) Define the terms normal distribution, standard normal distribution, Gamma distribution and chi square distribution. 4

(b) The weekly income of a group of 9,000 persons was found to be normally distributed with mean Rs. 1750 and standard deviation of Rs 150. 6

- (i) If 15% are the poorest find the minimum income of the rich people.
- (ii) If 15% are the richest find the minimum income of the richest people.

7(a) Define the terms Parameter, Statistics, point estimation, interval estimation and standard error. List out the properties of good Estimator. 4

(b) A sample of 100 engineers from small construction companies and a sample of 200 engineers from large construction companies were interviewed about having expense controls in place for use of cellular phones. Of the small companies, 47 had controls in place whereas 79 of the large companies had controls.

Contd. ...

(3)

Determine the 95% confidence in population proportion of expense controls in place for large and small construction engineers. (0.372, 0.568) (0.327, 0.463)

8(a) Define the terms Error in hypothesis testing. Also mention the steps of test of significance of difference of proportion.

(b) In a certain factory, there are two independent processes manufacturing the same item. The average weight in a sample of 250 items produced from one process is found to be 120 grams with a standard deviation of 12 gram, while the corresponding figures in a sample of 400 items from the other process are 118 grams and 14. Find the standard error of the difference of means and also test whether the two mean weights differ significantly at 10 percent level of significance. 3.874

9(a) What do you understand by Student t-Distribution. Write down the basic assumptions about the significance of single mean.

(b) Eleven students of B.E. were given a test in statistics. After being given 15 days special coaching given and thereafter were given a second test. Marks obtained in the two tests are below.

Students	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
I-test	23	20	19	21	18	20	18	17	23	16	19
II-test	24	19	22	18	20	22	20	20	23	20	18

Do the marks indicate the special coaching has benefited the students at 5% level of significance?

10(a) What are the conditions for validity of chi-square test?

(b) A large electronic firm that hires many handicapped workers wants to determine whether their handicaps affect such workers' performance. Use the 5% level of significance to decide on the basis of the sample data shown in the following table whether it is reasonable to expect workers' performance.

Types of Disability	Performance		
	Above Average	Average	Below Average
Blind	21	64	17
Deaf	10	49	14
No handicap	29	93	28

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PURBANCHAL UNIVERSITY

2012

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG203HS: Probability & Statistics

80

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer SEVEN questions, selecting at least FOUR questions from Group A and THREE from Group B.

Group A

1(a) Define the term A Continuous Frequency Distribution. Draw histogram and pie-chart for the following data given below: 1+4

Age-interval:	0-10	10-20	20-30	30-40	40-50
Frequency:	8	15	25	25	20

(b) The mean and standard deviation of a set of 50 observations were found to be 20 and 10 respectively. On checking it was found that two observations were wrongly taken as 15 and 17 instead of 20 and 19. Calculate the correct mean and standard deviation. 6

2(a) State and prove multiplication law of probability. If M, N and Q are three mutually exclusive events, then find the suitable expression for $P(M \cup N \cup Q)$. 5

(b) In a certain city, 60% of all households subscribe to the daily newspaper, 80% subscribe to the local after-noon paper, and 50% of all households subscribe to both papers. If a household is selected at random, what is the probability that it subscribes to (i) at least one of the two newspapers and (ii) exactly one of the two newspapers? 6

3(a) Define a random variable, probability mass function and probability density function of a random variable X. 5

Contd. ...

(i) P(A ∪ B)
(ii) P(A ∩ B)

(2)

(b) The monthly demand for transistor is known to have following probability distribution:

Demand:	1	2	3	4	5	6
P(x):	0.1	0.15	0.2	0.25	0.18	0.12

Determine the expected demand and variance demand for transistor. 6

(a) Discuss Poisson distribution. Also find its variance. 5

(b) In sampling of 10 items, there is a chance of getting a defective item is 40%. Find the following probabilities: 6

- (i) There are exactly two defective items in the sample.
- (ii) There are at least three defective items in the sample.
- (iii) There are at most seven defective items in the sample.

(a) Define normal probability distribution. Write down some characteristics of normal probability distribution. 1+5

(b) A box contains 10 red, 10 black and 5 green balls. Three balls are drawn at random from the box. Find the following probabilities using hyper-geometric probability distribution:

- (i) there are all green balls;
- (ii) there are two red and one black balls and
- (iii) there are one black and two red balls. 6

(a) What is meant by a joint probability mass function of a random variable (X,Y). Write down an expression for the marginal probability mass function of two random variables X and Y respectively. 5

(b) Suppose that the joint density function of a two-dimensional random variable (X,Y) is given by:

$$f(x,y) = k(6-x-y); 0 \leq x \leq 2, 2 \leq y \leq 4$$

$$= 0, \text{ otherwise}$$

- (i) Determine a value of k.
- (ii) Find a marginal probability density function of X and Y respectively.
- (iii) Check whether X and Y are independent or not.

Group B

(a) Define point estimation and interval estimation. What are the properties of a good estimator? 6

(b) A sample of 500 students taking entrance examination of MBBS revealed an average score of 56 and sample standard deviation of 10. Construct a 95% and 90% confidence interval for the population mean. 6

(3)

8(a) What do you mean by hypothesis? What are its types? Give them with examples.

(b) In a study of ten business houses, it was found that the average income is Rs. 6200 per month and standard deviation is Rs. 690. Test statistically the belief that the business houses have an average income Rs. 5500.

9(a) What do you mean by t-test for a single mean? What are its assumptions and what are the properties of t-test?

(b) Memory capacity of 10 students was tested before and after training. State whether the training was effective or not at the following scores at 5% level of significance.

Sample Units:	1	2	3	4	5	6	7	8	9	10
Before training:	12	15	12	8	10	11	15	5	14	10
After training:	14	18	10	15	16	8	9	10	12	11

10(a) Define Correlation and Regression. What are the properties of Karl Pearson's correlation coefficient?

(b) Find the coefficient of correlation from the following data:

X:	2	4	6	7	9	10	12	14	15	17
Y:	4	5	7	6	10	11	15	10	13	19

Also interpret its result.

11(a) Write down the steps involved in the Chi-square test of goodness of fit. Draw conclusion.

(b) For the following data, use a chi-square test of independence to test the hypothesis that there is no association between two attributes Performance and status of training at alpha = 0.05.

Status of Training	Performance		Total
	Good	Not Good	
Trained	100	50	150
Untrained	20	30	50
Total	120	80	200



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PURBANCHAL UNIVERSITY

2018

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG259CI: Surveying-II (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data.

Answer FIVE questions.

5×16=80

1(a) Explain Bowditch's Rule. What are the Horizontal and vertical control accuracies in traverse survey. 4+4

(b) Balance the following traverse by Transit Rule. Bearing of Line AB is 79°30' and independent co-ordinate of A is (2500N, 3500 E). 10

Traverse Leg	Length (m)	Angle
AB	64.25	<B = 50° 10' 47"
BC	41.98	<C=108° 21' 23"
CD	38.27	<D=83° 59' 56"
DA	62.56	<A=117° 41' 35"

2(a) What are the methods of tacheometry? Describe about movable hair method. 2+6

(b) Following observations were taken from two traverse stations by means of a tacheometer fitted theodolite with an anallactic lens. The constant of instrument is being 100. 8

Inst. Station	Staff station	Ht. of inst. (m)	Bearing	Vertical angle	Staff reading (m)
P	R	1.345	116°30'	7°15'	0.765, 1.595, 2.425
Q	S	1.423	35°45'	-9°45'	0.820, 1.840, 2.860

The co-ordinate of station P is 212.5mN, 186.8mW. The co-ordinate of station Q is 102.8mN, 100.4mW. Compute the length and gradient of the line RS if Q is 7m higher than P.

3(a) Derive an expression for "Base of the object inaccessible and instrument and object being in different plane", in trigonometric levelling. 8

Contd. ...

(2)

(b) The top Q of tower is observed from two station A and B apart such that horizontal angle QAB and QBA are 60° & 50° respectively. The angles of elevation of Q from A & B are $30^\circ 15' 00''$ & $29^\circ 0' 0''$ respectively. The reading on staff held on BM of RL 30m were 2.270m & 0.500 m respectively, from A & B. Determine the RL of the Top of the tower Q. Distance between A & B is 50m. 8

4(a) Write down the design steps of Transition curve. 8

(b) Two roads BA & AC intersects at an angle of 160° they are to be connected by circular curve with radius 500m. The chainage of the point of intersection A is (149+20.3) chain. Compute all the data required for laying out the curve of only 30m chain is available. 8

5(a) What are the factors that control choice of proper contour interval? Explain various method of contouring. 3+5

(b) Observations were made from station P to stations A, B and C and following data were obtained: 8

$\angle APC = 100^\circ 30' 15''$ and $\angle BPC = 110^\circ 3' 20''$. Coordinates of stations A, B, and C are as follows:

A(1000mE, 5200mN), B(3000mE, 5000mN) and C(2100mE,, 6200mN). Calculate the coordinates of P if P lies inside $\triangle ABC$.

6. Write short notes on any FOUR: 4×4=16

- (a) Vertical Curve
- (b) Spherical Triangle
- (c) Aerial Photogrammetry
- (d) Remote Sensing
- (e) Total Station



PURBANCHAL UNIVERSITY

2017

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG259CI: Surveying-II (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data.

Answer FIVE questions.

5×16=80

1(a) Write about principles of traverse. Differentiate between the Bowditch and Transit method of balancing the closed traverse. 2+4

(b) Calculate the latitudes and departures & closing error for the following traverse and adjust using Bowditch & transit method. If the co-ordinate of A is (1000mN,1000mE) compute the independent co-ordinate of all the stations. 10

Line	Length (m)	Bearing
AB	89.31	45°10'
BC	219.76	72°05'
CD	151.18	161°52'
DE	159.10	228°43'
EA	232.26	300°12'

2(a) Derive the tacheometric relation for horizontal & vertical distance for the inclined line of sight with vertically held staff. 6

(b) Two tangents meet at chainage of 1250m, the external deflection angle being 41°00'. It is proposed to introduce a circular curve of radius 150m in between two tangents. Calculate necessary data to set out the curve by Rankine's method of tangential deflection angle. Take peg interval =10m. 10

3(a) Define contour & contour interval and explain about the characteristics of contour. 2+4

(b) A Tachometer fitted with an anallactic lens and multiplying constant 100 was setup at C and the following readings were taken on a vertically held staff. 10

Contd. ...

(2)

Inst. Station	Staff station	Vertical angle	Staff readings (m)			Remarks
C	BM	-5°20'	1.500	1.800	2.100	RL of BM = 750.000
	D	+18°12'	0.750	-	2.250	

Calculate the horizontal distance from BM to D and RL of D if angle subtended at C is 40°.

- 4(a) Define the elements of transition curve with sketches. Why is it necessary to introduce the transition curve on circular curve? 3+3
- (b) To determine the coordinates of station P, following observations were taken to three stations A, B, and C whose coordinates are known. 10

Coordinates of A (60290.50mE, 97532.0mN)
 Coordinates of B (57524.50mE, 93646.30mN)
 Coordinates of C (65739.0mE, 96752.0mN)
 $\angle APC = 123^\circ 49' 00''$
 $\angle BPA = 41^\circ 21' 55''$

Find the coordinates of P by using ($\phi - 45^\circ$) method.

- 5(a) Explain about the scale of the vertical photograph and features of total station. 4+4
- (b) In a triangulation survey trigonometrical observations were taken from station A to a signal kept over station B and the following observations were made: 8

Horizontal distance from A to B = 17200m
 Reduced level of station A = 1250.50m
 Height of instrument at A = 1.664m
 Height of signal at B = 3.402m
 Angle of depression from A to B = 00°51'38"
 Coefficient of refraction; m = 0.07

Take $R \sin I'' = 30.9597$ m where R is the mean radius of the earth.

Determine the RL of station B.

$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
 5504.048
 $\frac{D}{TC}$

(3)

- 6(a) Write short notes on:
 (i) Celestial sphere and spherical triangle
 (ii) Remote sensing
- (b) The altitudes of two proposed stations A and B, 100 km apart, respectively 420 m and 700 m. The intervening obstruction situated at C, 70 km from A has an elevation of 478 m. Ascertain if A and B are inter-visible and if necessary find by how much should be raised, so that the line of sight must nowhere be less than 3 m above the surface of the earth:

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PURBANCHAL UNIVERSITY

2016

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG259CI: Surveying-II (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data.

Answer FIVE questions.

5×16=80

1(a) What are the different stages of field work during a theodolite traversing? Explain each in brief. 6

(b) A closed traverse ABCDEA was running in anti-clockwise direction. Following observations were recorded:

Line	Length (m)	Bearing
AB	217.5	120°15'
BC	318.0	62°30'
CD	375.0	322°24'
DE	283.5	235°18'

Calculate the length and bearing of the line EA. 10

2(a) What do you understand by tacheometry? Explain the different system of tacheometry, briefly? 1+5

(b) Determine the gradient from a point A to a point B from the following observations made with a fixed hair tacheometer fitted with an anallatic lens. The constant of the instrument was 100 and the staff was held vertically. 10

Instrument Station	Staff Station	Bearing	Staff Readings (m)	Vertical Angle
P	A	340°00'	1.90, 2.60, 3.30	+12°38'
	B	70°00'	1.60, 2.20, 2.80	+8°52'

3(a) What do you mean by a transition curve? Explain the necessity of a transition curve? Enlist the various methods of setting out of the transition curve? 2+3+1

Contd. ...

(2)

- (b) Determine and tabulate the necessary data to set out the simple circular curve by Rankine's deflection angle method for the following data: 10

Chainage of IP= 1230m

Radius= 450m

Deflection angle= $44^{\circ} 30'$

Peg interval= 30m

- 4(a) What is relief displacement? What are the various types of aerial photographs, explain in brief? 1+3

- (b) Introduce remote sensing in brief. 4

- (c) A theodolite was set up in between two towers A and B. The distance of the theodolite station from A is 50 m and from B, 120 m. Observations were taken from the theodolite to the top of the towers A and B were recorded as $33^{\circ} 26' 20''$ and $30^{\circ} 50' 40''$ respectively, telescope focused upward for both the cases. The RL of the trunnion axis of the theodolite was 179.675 m above MSL. Calculate the RL of the top of the towers A and that of B. 8

- 5(a) What are the various methods of interpolating contour? Explain them briefly with giving examples and sketches. 8

- (b) Observations were made from station 'P' to the station A, B and C and the following data were obtained:

$\angle APC = 100^{\circ} 30' 45''$ and $\angle BPC = 110^{\circ} 05' 20''$

Coordinates of stations A, B and C are as follows:

A(1000mE, 5200mN), B(3000mE, 5000mN) and C(2100mE, 6200mN)

Calculate the coordinates of 'P' if P lies inside triangle ABC. 8

- 6(a) Two triangulation stations C and D are 60 km apart and have elevations of 230 m and 270 m respectively. Find the minimum height of signal required to be erected at D, so that the line of sight may not pass nearer the ground than 3 m. The intervening ground may be assumed to have a uniform elevation of 189 m. 8

- (b) Write short notes on any TWO: 4+4

(a) EDM and its classification

(b) Merits of GPS

(c) Characteristics of Total Station

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PURBANCHAL UNIVERSITY
2016

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG259CI: Surveying-II (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data.

Answer **FIVE** questions.

5×16=80

- 1(a) Define angular misclosure and closing error in theodolite traverse. Describe transit method of balance closing error. 3+3
- (b) Calculate the latitudes and departures and closing error for the following traverse and adjust using Bowditch's method. If co-ordinate of A is (1000m, 1000m) compute independent co-ordinate of all stations. 10

Line	Length (m)	WBC
AB	89.31	45° 10'
BC	219.76	72° 05'
CD	151.18	161° 52'
DE	159.1	228° 43'
EA	232.26	300° 12'

- 2(a) Explain field procedure for determining constant 'k' and 'c'. 6

- (b) A Tacheometer fitted with an anallactic lens and multiplying constant 100 was set up at C and the following readings were taken on a vertically held staff.

Inst. Station	Staff Station	Vertical Angle	Staff Readings (m)			Remarks
			1.500	1.800	2.100	
C	BM	-5° 20'	0.750	?	2.250	RL of BM = 750.0,
	D	+18° 12'				

Calculate the horizontal distance from BM to D and RL of D if angle subtended at C is 40°. 10

Contd. ...

(2)

3(a) Define a Contour line. How are contour maps useful to a civil engineer? Describe any one method of contour interpolation. 1+2+3.

(b) Two triangulation stations P and Q are 40km apart and have elevations of 240m and 270m respectively. Find the minimum height of signal required at Q, so that the line of sight may not pass nearer the ground than 2m. The intervening ground may be assumed to have a uniform elevation of 190m. 10

4(a) What is transition curve? Define elements of transition curve with figure. What are the advantages of introducing transition curve on circular curve? 2+4+2

(b) Determine the necessary data to set out the simple curve by Rankine's Method of Tangential Deflection Angle from the following: 3

Chainage of IP= 1238m

Radius of curve= 240m

Deflection Angle= $32^{\circ}30'00''$

Peg interval= 20m

5(a) What is photogrammetry? What are the merits and limitation of photogrammetry? 2+2+2

(b) Observations were made from station P to the stations A, B and C and the following data were obtained:

$\angle APC = 100^{\circ} 30' 45''$ and $\angle BPC = 110^{\circ} 05' 20''$

Coordinates of stations A, B and C are as follows:

A(1000mE, 5200mN), B(3000mE, 5000mN) and C(2100mE, 6200mN)

Calculate the coordinates of P if P lies inside triangle ABC. 10

6. Write short notes on any FOUR: 4×4=16

(a) Remote Sensing

(b) Characteristics of contours

(c) Triangulation and Trilateration

(d) Principle of EDM

(e) Total Station



PURBANCHAL UNIVERSITY

2015

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG259CI: Surveying-II (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data.

Answer FIVE questions.

5×16 = 80

1(a) What do you mean by closing error? What are the different methods of balancing the traverse? Explain any one method of balancing the traverse, briefly. 1+1+4

(b) ABCD is closed traverse in which the bearing of AD has not been observed and the length of BC has been missed to be recorded. The rest of the field record is as follows:

Line	Length (m)	Bearing
AB	335	S 1° 18' W
BC	?	N 90° 00' E
CD	408	N 2° 24' W
DA	828	?

Find the length of BC and bearing of the line AD. 10

2(a) Derive an expression for the horizontal distance and elevation of a vertical staff if the line of sight is inclined. 6

(b) A fixed hair tacheometer fitted with an anallatic lens and having its constant 100 was set up at station T and the following readings on a vertically held staff were made:

Station Sighted	Bearing	Readings of stadia hairs (m)	Readings of axial hairs (m)	Vertical Angle
R	330° 50'	0.715, 2.385	1.650	+10° 30'
S	60° 50'	0.565, 3.455	2.010	+8° 50'

Determine the gradient between the point R and S. 10

Contd. ...

(2)

- 3(a) Define transition curve. What are the methods of setting out of transition curve? Explain any one method of setting out of transition curve in the field. 1+1+4
- (b) A downgrade of 1% is followed by an upgrade of 1.4%. The RL of the point of intersection is 150.00m and its chainage is 450m. Calculate the RL on the points on the curve and the staff readings required if the pegs are to be driven with their tops at the formation of the curve. Assume the rate of change of grade to be 0.2 per 20m chain and the height of instrument (height of collimation) is 153.000m. 10
- 4(a) Explain about overlap in photogrammetric surveying. Why overlap in photogrammetric surveying is necessary? Explain in brief. 4
- (b) Explain briefly the characters of spherical triangles. 4
- (c) Derive the expression to determine the RL of top of an elevated object when the base of the object is inaccessible. 8
- 5(a) Write down the characteristics of contour with necessary sketches. 8
- (b) Two triangulation stations A and B are 50 km apart and have reduced level of 250m and 280m respectively. Find the minimum height of signal required at B, so that the line of sight may not pass nearer the ground than 2m. The intervening ground may be assumed to have a uniform reduced level of 210m. 8
- 6(a) Write short notes on: 4+4
- (a) EDM and its classification
- (b) Total station and its characteristics
- (b) Describe any one analytical method of solving three point problems. 8



PURBANCHAL UNIVERSITY

2014 (New)

B. E. (Civil)/Fourth Semester/Chance

Time: 03:00 hrs.

BEG259CI: Surveying-II

Full Marks: 80 /Pass Marks: 32

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions,

- 1(a) What do you understand by latitude & departure of a traverse leg and closing error in a closed traverse? Discuss about the Bowditch rule for balancing the closing error in a closed traverse. 3+3
- (b) A traverse is run to set out a line MQ = 1900m at right angle to a given line MN. The lengths and bearings of traverse legs are observed as follows:

Line	Length	Bearing
MN	-	360°00'
MO	850	120°00'
OP	1000	86°30'
PQ	-	-

Compute the length & bearing of PQ. 10

- 2(a) What is trigonometrical leveling? Explain the procedure & derive the expression to find out the elevation of top of the object for the case, base inaccessible and instrument stations are in different vertical plane. 1+5
- (b) Determine the gradient from a point A to a point B from the following observations made with a fixed hair tachometer fitted with anallactic lens, the constant of instrument being 100. 10

Vertical angle	bearing	Reading of st. hairs	Axial hair
+ 15° to A	345°	0.750, 2.120	1.435
+ 10° to B	75°	0.625, 3.050	1.837

Contd. ...

PURBANCHAL UNIVERSITY

2012

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG258CI: Surveying-II

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume any data if necessary. 5×16=80

- 1(a) Write down the history and development of surveying? Surveying is the most important tool for the Civil Engineers, Justify? 4+4
- (b) A 25m steel tape was standardized at a temperature of 22°C and under a pull of 8 kg. The tape was used in catenary at a temperature of 35°C and under a pull of 15 kg. The cross sectional area of the tape is 0.025 CM², its weight per unit length is 20 g/m, Young's modulus of elasticity is 2×10^6 kg/CM², $\alpha = 11 \times 10^{-6}$ per °C. Find the total correction per tape length. 8

2(a) What are the different methods of plane tabling, explain any two briefly with sketches? 8

(b) A survey line PQ intersects a building. To overcome the obstacle a perpendicular QR, 85 m long, is set out at Q. From R, two lines RS and RT are set out at angles 50° and 65° respectively with RQ. Find the lengths RS and RT such that points S and T fall on the prolongation of PQ. Also find the obstructed distance QS? 8

3(a) What are the different methods of levelling? Explain briefly with sketches if necessary. 8

(b) The following readings were successively taken with a level: 0.355, 0.485, 0.625, 1.755, 1.895, 2.350, 1.780, 0.345, 0.685, 1.230 and 2.150 m.
 BS BS FS BS

The instrument was shifted after the 4th and 7th readings. Prepare a level book and calculate the RLs of different points. The RL of the 1st point is 465.500m. 8

Contd. ...

(2)

4(a) Define closing error in compass traversing? How can you adjust the closing error in compass traversing graphically? 8

(b) The following bearings were observed while traversing an area with a compass.

Line	FB	BB
AB	S 37° 30' 00" E	N 37° 30' 00" W
BC	S 43° 15' 00" W	N 44° 15' 00" E
CD	N 73° 00' 00" W	S 72° 15' 00" E
DE	N 12° 45' 00" E	S 13° 15' 00" W
EA	N 60° 00' 00" E	S 59° 15' 00" W

At which of these stations would local attraction be suspected? Find the corrected bearing of the lines? 8

5(a) What are the fundamental lines of a transit theodolite? Elaborate the relationship of these lines between them with necessary sketches. 1+5

(b) Explain the Trapezoidal formula and Prismoidal formula for computing volume in brief? 6

(c) The following offsets were taken from a chain line to an irregular boundary line at an interval of 10 m:

0, 2.50, 3.50, 5.00, 4.60, 3.20, 0 m.

Compute the area between the chain line, the irregular boundary line and the end offsets using Simpson's Rule. 4

6. Write short notes on any FOUR: 4x4=16

(a) Offset in chain surveying

(b) Significant figures and Rounding off numbers

(c) Global positioning ground by stepping method

(d) Chaining on sloping ground by stepping method

(e) Distinguish between Height of Instrument and Rise & Fall method

(2)

3(a) Define contour & contour interval and explain about the characteristics of contour. 1+1+4

(b) 0.5% falling gradient meets a 3% raising gradient at chainage 1000.00m and reduced level 900.00m. A vertical curve is to be set out by pegs driven at 20 m interval to connect these two gradients. Calculate the chainage and RLs of ends of the curve and its each peg points. Assume the rate of change of grade is 0.25% per 20m. 10

4(a) Explain about the various elements of circular curve. Why is transition curve provided along with circular curve? 5+1

(b) The altitudes of two proposed stations A and B, 100 km apart are respectively 420 m and 700 m. The intervening obstruction situated at C, 70 km from A has an elevation of 478 m. Ascertain if A and B are inter-visible and if necessary find by how much B should be raised, so that the line of sight must nowhere be less than 3 m above the surface of the earth.

5(a) Explain about the scale of the vertical photograph. 5+1

(b) Following observations were made from station P to the station A,B,C: $\angle APB = 63^\circ 08' 50''$, $\angle BPC = 47^\circ 17' 13''$

Coordinate of station A,B,C are as follows

A(56138.50mE, 98208.30mN)

B(58587.0 mE, 102900.10mN)

C(63101.10mE, 102458.10mN)

Calculate the coordinate of station p, if p lies outside the triangle ABC.

6. Write short notes on any FOUR: 4x4=

(a) Total station

(b) Derive the expression for horizontal distance using tachometer with the staff held vertical & inclined line of sight

(c) Remote sensing

(d) Intersection & Resection

(e) Principal & purpose of triangulation

(f) Celestial sphere and spherical triangles

PURBANCHAL UNIVERSITY

2013

B. E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG259CI: Surveying-II

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions,

1(a) Explain the field procedure for theodolite traversing. 6

(b) A closed traverse was conducted round an obstacle and the following observation were made. Find the missing quantities. 10

Side	Length	Azimuth
AB	?	33°45'
BC	300	86°23'
CD	?	169°23'
DE	450	243°54'
EA	268	217°30'

2(a) Explain field procedure for determining constant 'K' and 'C'. 6

(b) The following observations were taken from an anallatic lens fitted with a tacheometer having instrument constant 100.

Inst. stn.	Staff stn.	Bearing	Staff Reading	Zenital angle
P	A	320°30'	1.90, 2.60, 3.30	63°20'45"
	B	140°30'	**, 2.20, **	89°48'20"

Top and bottom readings at station B could not be read due to obstacle, but the distance between P and B was measured as 150m. Find the gradient of the line BA. 10

3(a) Derive an expression to find the RL of top of an object when both instrument station and elevated object are in the same vertical plane.

Contd. ...

(2)

(b) The top (Q) of a chimney was sighted from two stations P and R at very different levels, the stations P and R being in line with the top of the chimney. The angle of elevation from P to top of chimney was $35^{\circ}12'$ and that from R to the top of the chimney $16^{\circ}48'$. The angle of elevation from R to a vane 1m above the foot of the staff held at P was $8^{\circ}24'$. The heights of instrument at P and R were 1.85m and 1.65m respectively. The horizontal distance between P and R was 100m and RL of R was 248.260m. Find the RL of the top of the chimney and the Horizontal distance from P to the chimney. 10

4(a) How do you set out a simple curve in the field by Rankine's method? Explain with neat sketch. 6

(b) The coordinates of three stations A, B and C are given and a point O is set up in the respected field and observations are made. Calculate the coordinate of station O. 10

Station	Easting (m)	Northing (m)	Angle
A	24078.31	29236.48	BOA = $142^{\circ}48'32''$
B	26266.48	31493.20	COB = $092^{\circ}12'22''$
C	28377.67	29661.04	AOC = $124^{\circ}59'00''$

5(a) Define interpolation. Explain any one method of interpolation of Contour. 8

(b) A horizontal grade meets a -2.5% grade at 3035m chainage and 218.905m elevation. A vertical curve of 16 meter length with 4m peg intervals is to be introduced. Calculate the necessary elevations on the curve, 8

6. Write short notes on any FOUR 4x4 = 16

- (a) Remote sensing
- (b) Total station
- (c) Triangulation and Trilateration
- (d) Characteristics of Contour
- (e) Relief displacements
- (f) Element of transition curve

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PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG263CI: Engineering Hydrology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5×16=80

- 1(a) Define hydrological cycle and explain the application of hydrology in the field of civil engineering. 2+6
- (b) The normal annual rainfall of stations A,B,C and D of any watershed area are 81, 68, 77, 92 mm respectively. In 2010 the station D was inoperative when station A,B,C recorded annual rainfall of 92,73, 80mm respectively. Estimate the missing rainfall at station D in the year 2010 by normal ratio method? 8
- 2(a) Define actual evapotranspiration and potential evapotranspiration. Derive the equation of Penman method in which explaining the net radiation, solar radiation and Boltzmann constant. 3+7
- (b) The following are the rates of rainfall for successive 20 minutes period of a 140 minutes storm: 2.6, 2.6, 11.0, 7.5, 1.30, 1.30, 5.0 cm/hr. Taking the value of ϕ index as 3.22 cm/hr, find out the net runoff in cm the total rainfall and value of W_{index} . 2+2+2
- 3(a) Define infiltration. What are the factors affecting infiltration? Enumerate the significance of Horton's equation. 1+4+1
- (b) During a high flow, water surface elevations of a small stream were noted at two sections A and B, 10Km apart. These elevations and other salient hydraulic properties are given below:

Section	Water surface elevation(m)	Area of cross -section (m ²)	Hydraulic radius(m)
A	104.771	73.293 ✓	2.733
B	104.500	93.375	3.089

The appropriate eddy loss coefficients are 0.3 for gradual expansion and 0.1 for gradual contraction. Estimate the discharge in the stream, assuming Manning's roughness coefficient, as 0.020. 10

Contd. ...

(2)

4(a) The ordinates of a 4-hour unit hydrograph of a catchment are given below:

T(h)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinate of 4-h UH(m ³ /s)	0	20	60	150	125	95	75	50	35	25	15	0

Derive the flood hydrograph in the catchment due to the storm given below:

Time from start of storm (h)	0	4	8	12
Accumulated rainfall (cm)	0	5.0	5.8	8.8

The Φ index for the catchment can be assumed to be 0.25 cm /hr and constant base flow of 20m³/s is appropriate. 8

(b) What are the assumption and limitation of Unit Hydrograph and being a water engineer how do you incorporate the role of ground water in development of irrigation sector in Nepal? 4+4

5(a) The estimated peak flood at Koshi Barrage using Gumbel's method for two different return period is given below. 8

Return period (Year)	Peak discharge in cumecs
100	500.00
50	400.00

Estimate the floods discharge for the barrage for return period of 500 and 1000 years?

(b) What is double mass curve? How do you adjust the error using double man curve method? 2+6

6(a) A tube well of 30cm diameter penetrates fully in an artesian aquifer. The strainer length is 15.00m. Calculate the yield from the well under a drawdown of 3.0 m The aquifer consists of sand of effective size 0.2mm having co-efficient of permeability equal to 50m/day .Assume radius of drawdown equal to 150 m. 8

(b) Explain the factor affecting the runoff and how can you measure the discharge of any river? 4+4



PURBANCHAL UNIVERSITY

2017

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG263CI: Engineering Hydrology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

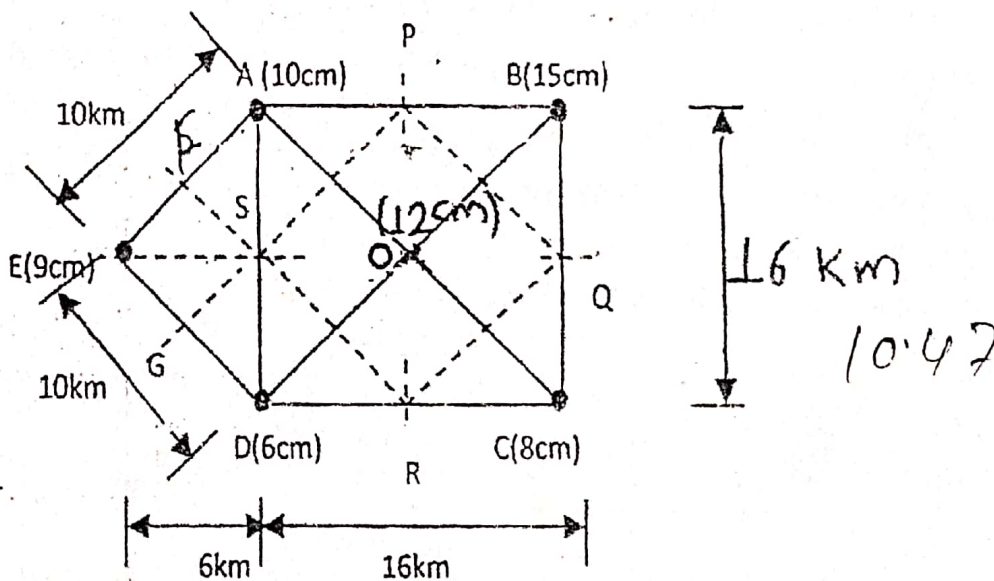
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5×16=80

1(a) Describe the importance and application of hydrology in civil engineering. 8

(b) Figure below represents a catchment area with the precipitations observed in a year. Calculate the mean precipitation by Thiessen method and check the result by the arithmetic mean method? 8



2(a) Calculate the potential evapotranspiration for an area over Kathmandu in the month of January by Penman method using following data:

Mean monthly temperature = 11.5°C, Mean RH = 75%, Mean sunshine hours = 9h, Potential sunshine hours = 11.6 h, Wind velocity at 2m height = 100 km/day, Albedo = 0.15, Upper terrestrial solar radiation = 8mm of Hg/day

Other values

Latitude = 26.5°, Longitude = 84.5°

3.643

47.67

Contd. ...

(2)

Saturated vapor pressure at 11.5°C = 10.4 mm of Hg, Slope of saturated vapor pressure curve = 1.24mm/°C, Psychrometric constant = 0.49mm/°C, Boltzman constant = 2.01 × 10⁹ mm/day. 8

(b) (i) A catchment has seven raingauge stations. in a year, the annual rainfall in cm recorded by the gauges are as follows: 130, 142.1, 118.2, 108.5, 165.2, 102.1, 146.9. For a 5% error in the estimation of the mean rainfall, calculate the minimum number of additional stations required to be established in the catchment. 5 4

(ii) Describe the factors affecting infiltration. 4

3(a) The average rainfall over a basin of area of 50ha during a storm was as follows: 8

Time (hr)	0	1	2	3	4	5	6	7
Rainfall (mm)	0	6	11	34	28	12	6	0

If the volume of runoff from this storm was measured as 25 × 10³ m³, determine the index for the storm

(b) Describe the method that you adopt to estimate the discharge for high floods. 8

4(a) A small stream has trapezoidal section having base width of 12m and side slope 2:1 (H:V) in a reach of 8km. During a flood the high water records at the end of the reach is given below. Estimate the food discharge of the river. 10

Section	Elevation of bed (m)	Water surface elevation (m)	Remarks
Upstream	100.2	102.7	Manning's n = 0.03
Downstream	98.6	101.3	

(b) What is flood? How do you mitigate flood in flood prone area? Explain. 6

5(a) The ordinates of a 4 hour UH of a basin of area 25 km² are given below: 10

T(hr)	0	4	8	12	16	20	24	28	32
UH(m ³ /s)	0	30	55	90	130	170	180	160	110

Calculate the following:

(i) 4-hr DRH for a rainfall of 3.25cm with φ-index of 0.25cm

(ii) 12-hr UH by using the method of superposition.

(3)

(b) What are the factors that affect the runoff from a catchment. 6

6(a) Using 30 years data and Gumbel's method, the flood magnitude for return periods of 100 and 50 years for a river are found to be 1200 and 1060 m³/s respectively. 8

(i) Determine the mean and standard deviation of the data used? Take values of reduced mean and reduced standard deviation in Gumbel's Extreme value distribution for n=30 as 0.5362 and 1.1124 respectively.

(ii) Estimate the magnitude of the flood with a return period of 500 years.

(iii) What are the 95% and 80% confidence limits for this estimate if f(95%) = 1.96 and f(80%) = 1.28.

(b) Write short notes on any TWO: 4+

(i) Role of groundwater in irrigation development

(ii) Current meter

(iii) Double Man Curve



PURBANCHAL UNIVERSITY

2016

B.E. (Civil)/Fourth Semester/*Final*

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG263CI: Engineering Hydrology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5×16=80

1(a) What is hydrological cycle? Explain its components briefly with sketch. 6

(b) A small catchment of area 150 ha received a rainfall of 10.5 cm in 90 minutes due to a storm. At the outlet of the catchment, the stream draining the catchment was dry before the storm and experience a runoff lasting for 10 hours with an average discharge value of 2m³/s. the stream was again dry after the runoff event: a) what is the amount of water which was not available to runoff due to combined effect of infiltration, evaporation and transpiration? b) What is the ratio of runoff to the precipitation? 6+4

2(a) Explain the methods to calculate average rainfall over a catchment using data from raingauge station network? Illustrate them with sketch. 6

(b) The annual precipitation at station Z and the average neighbouring station are as follows:

Year	Precipitation at Z(mm)	10 stations average (mm)
1972	35	28
1973	37	29
1974	39	31
1975	35	27
1976	30	25
1977	25	21
1978	20	17
1979	24	21

Year	Precipitation at Z(mm)	10 stations average (mm)
1980	30	26
1981	31	31
1982	35	36
1983	38	39
1984	40	44
1985	28	32
1986	25	30
1987	21	23

(2)

Use double mass curve analysis to correct any data inconsistencies at station Z for later years. 10

3(a) A storm with 10.0 cm precipitation produced a direct runoff of 5.8cm. Estimate ϕ -index of the storm using given time distribution of the storm. 8

Time from start (h)	1	2	3	4	5	6	7	8
Incremental rainfall in each hour (cm)	0.4	0.9	1.5	2.3	1.8	1.6	1	0.5

(b) How do you measure the flow in the river cross-section using velocity area method? Explain with sketch. 8

4(a) Followings are the ordinates of the hydro graph of flow from a catchment area of 770 km² due to 6hr rainfall. Derive the ordinates of flood hydrograph due to 3.3cm effective rainfall of 2-hr duration. Make a suitable assumption regarding base flow. 10

T(hr)	0	6	12	18	24	30	36	42	48	54	60	66	72
Q(m ³ /s)	40	65	215	360	400	350	270	206	145	100	70	50	42

(b) What do you mean by Unit Hydrograph? Explain its assumptions and limitations. 8

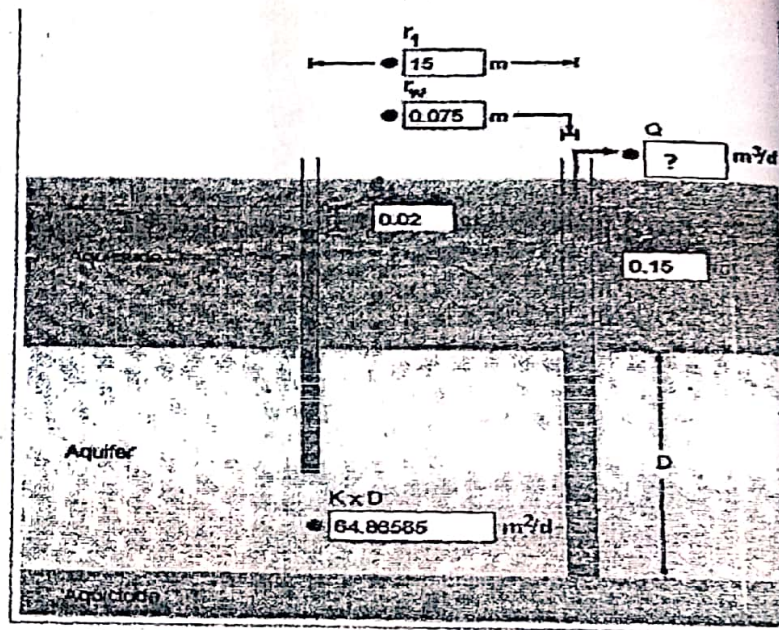
5(a) In a time series data of annual peak flood for 75 years, the mean and standard deviations are found to be equal to 5565 and 1752 m³/s respectively. Using $y_n=0.556$ and $S_n= 1.189$ (for 75 years):

(i) Determine the peak flood for 0.4% and 0.25% exceedance probability by Gumbel's method.

(ii) What would be the confidence limit at 80% and 90% confidence level if $f(c)=1.282$ and 1.645 for 80% and 90% confidence level respectively. 4+4

) Using the figure below calculate the discharge from the main well. 8

(3)



6(a) Define flood. Write cause and effects of flood. What are the hydro-geomorphological characteristics of flood? 1+2+5

(b) The following are the monthly pan evaporation data from January to December at Kathmandu Airport station in a year in cm. 16.7, 14.3, 17.8, 25.0, 28.6, 21.4, 16.7, 16.7, 16.7, 21.4, 16.7, 16.7. The water spread area in the beginning of January was 2.8km² and at the end of December it was measured as 2.55km². Calculate the loss of water due to evaporation in that year. Assume pan coefficient as 0.7.

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG263CI: Engineering Hydrology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5x16 = 80

1(a) Describe importance of hydrology and its application in engineering. 4+4

(b) A pentagonal plot consists of a rectangle and a triangle. The triangle is attached to one side of the rectangle forming the pentagon. The sides of rectangle are 3, 5, 3 and 5 km and that of the triangle are 5, 4 and 4 km. If the rainfall at the corners of the rectangle are 12, 8, 13.5, 11 cm and at the vertex of the triangle is 7cm, resulting from the storm, calculate the average precipitation. 8

2(a) Using Penman's formula, calculate consumptive use of rice vegetation for the month of February. Take the following data: 8

(i) Wind velocity measured at 2m height= 30 km/day

(ii) Elevation of the area= 220m

(iii) Relative humidity= 50%

(iv) Mean monthly temperature= 16°C

(v) Latitude= 22°N

(vi) Saturation vapour pressure= 13.67 mm Hg

(vii) Gradient of saturation vapour pressure versus temperature curve= 0.86 mm per °C

(viii) Extraterrestrial radiation for given latitude= 11.94 mm/day

(ix) Maximum possible sunshine hour= 11.42 hr.

(x) Actual sunshine hour= 7.20 hr

(xi) Albedo= 0.20

(b) What is φ index? Describe its construction procedural steps for basin producing runoff. 2+6

Contd. ...

PURBANCHAL UNIVERSITY

2016

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG263CI: Engineering Hydrology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5x16=80

1(a) Describe hydrological cycle with a neat sketch and labels on it. 8

(b) During a month of a rain gauge went out of order while the other three gauges in the basin reported rainfall of 107, 89 and 120 mm. If the normal annual rainfalls for these three gauges are 1120, 935 and 1200 mm respectively and the normal annual rainfall of the broken gauge is 978 mm, estimate the missing monthly rainfall at the broken gauge. 8

2(a) Describe the weighing bucket type recording rain gauge with a neat sketch. Mention its advantage and disadvantage. 5+3

(b) For a drainage basin of 600 km², isohyets drawn for a storm gave the following data:

isohyets interval (cm):	15-12	12-9	9-6	6-3	3-1
inter-isohyets area (km²):	92	128	120	175	85

Estimate the average depth of precipitation over the catchment. 8

3(a) Define evapotranspiration and factors that affect it. 2+4

(b) The ordinates of a 4 h UH of a basin of area 300 km² measured at 1 h intervals are 6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17, 13, 9, 6, 3 and 1.5 m³/s respectively. Obtain the ordinates of a 3 h UH for the basin using the S-curve technique. Ignore the discharge fluctuation at tail end. 10

4(a) Describe the factors to be considered while selecting stream gauging site. 3

Contd. ...

(2)

- (b) The data obtained during a stream gauging using a current meter with a rating $v = 0.04 + 0.65 N$ is given below. The velocity at all the verticals is measured at 0.4 times the depth of flow from the streambed. Compute the discharge using area-velocity method. 8

Distance from the bank (m)	Depth (m)	Revolutions	Time (s)
0	0	0	0
1.0	0.8	18	44
4.0	1.8	30	52
7.0	3.2	40	42
10.0	3.7	65	51
13.0	3.0	54	54
16.0	2.8	51	50
19.0	2.6	46	49
21.0	2.4	44	53
24.0	2.0	20	41
25.0	0	0	0

- 5(a) Describe hydro geomorphological characteristics of river. 8
- (b) The flood frequency for a stream has been found to be as follows:

Return Period (years)	Peak discharge (m ³ /s)
10	109
200	244

Estimate the peak discharge for the return periods of 400 years and 5 years by using the Gumbel method. 8

- 6(a) Derive the relation of discharge from unconfined aquifer with required sketch. 8
- (b) Write short note on any TWO: 4+4
- (a) Rainfall hyetograph
- (b) Infiltration
- (c) DAD Curve



(2)

- 3(a) List Dupit's assumptions. Derive expression for steady radial flow into a well in unconfined aquifer from basic principle.
- (b) During very high flood, a site becomes inaccessible. Under such situation, suggest appropriate method of discharge measurement with its procedural steps.

- 4(a) A watershed of 3130 sq. km was subjected to a storm of 4 days duration from which the following hydrograph resulted:

Time (hr) using 24 hrs clock	3	6	9	12	15	18	21	24	3	6
Discharge (m ³ /s)	20	16	175	270	230	200	170	150	130	115
Time (hr) using 24 hrs clock	9	12	15	18	21					
Discharge (m ³ /s)	100	90	80	70	60					

What is the rainfall excess for the storm? Obtain an UH for the watershed. Use straight line method for base flow separation.

- (b) Describe why knowledge of flood is important in water resources planning. Explain mitigation measures of flood affecting irrigation command area. 3

- 5(a) The following information are available at a gauging site:

River	Data length (Years)	Mean of flood (m ³ /s)	Standard deviation (m ³ /s)
A	80	6200	2850
B	50	5400	3210

- (i) Estimate 200 years and 500 years floods for the two rivers using Gumbel's method.
- (ii) Estimate 95% confidence limits for the 200 years and 500 years flood.

- (b) Distinguish between the followings:
- (i) Infiltration capacity and infiltration rate
- (ii) Depression storage and interception

6. Write short notes on:

- (a) Return Period
- (b) Limitations of unit Hydrograph
- (c) Limitations of Rational formula
- (d) Ideal location for a rain gauge station



PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG263CI: Engineering Hydrology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Justify the importance of hydrology in civil engineering. Also briefly discuss on the various process involved in hydrological cycle with neat sketch. 3+5

(b) The infiltration rates observed during a test on a double ring infiltrometer are as given below:

t(hrs)	0.0417	0.125	0.333	0.75	1.5	2.5	3.5	4.5	5.5
f(cm/h)	0.781	0.747	0.662	0.535	0.370	0.255	0.224	0.218	0.207

Determine the constants f_0 , f_c and K of the Horton's equation which fits the above data. 8

2(a) Write down Penman equation and explain all variables and constants involved in it with units. 8

(b) With the following data, compute discharge for a river: 8

Distance from the bank (m)	Depth (m)	Revolution at 0.6d (Number)	Duration of Observations (sec.)
0	-	-	-
1	1	40	100
3	2	60	100
5	2.5	110	150
7	2	90	150
9	1.5	50	100
11	1	30	100
12	-	-	-

Contd. ...

(2)

Calibrated value of constants for current meter: $a=0.51$ and $b=0.03$.

3(a) What does 'stream gauging' mean? Describe the velocity area method used for stream gauging. 2+6

(b) The following are the ordinates of the total runoff hydrograph of flow from a catchment area of 770 km^2 due to 6 hour rainfall. 3+5

T (hr)	0	6	12	18	24	30	36	42	48	54	60	66	72
Discharge, Q(m ³ /s)	40	65	215	360	400	350	270	205	145	100	70	50	40

(i) Derive the ordinates of 6-hr unit Hydrograph in tabular form.

(ii) Calculate the flood hydrograph for 2 successive storms of 9.5 cm and 12.5 cm of 6 hours duration having Φ -index of 0.25cm/hr.

4(a) Define unit hydrograph. What are the assumptions and limitations of unit hydrograph? 8

(b) The following peak discharge represents the annual maximum flows for the Bagmati River at Karmaiya for the year 1961 to 1975. 8

Year	1961	1962	1963	1964	1965	1966	1967	1968	1969
Peak discharge (m ³ /s)	4510	7060	4550	3500	3420	3880	2740	3650	4350
Year	1970	1971	1972	1973	1974	1975			
Peak discharge (m ³ /s)	2660	8030	3090	4080	2930	2410			

Calculate the 10-, 50- and 100- year flood assuming Gumbel distribution. The Gumbel's reduced mean and reduced standard deviation for 15 samples are 0.53 and 1.10 respectively.

5(a) What are the methods to calculate the mean rainfall over a drainage basin? Write the advantage and disadvantage of these methods. 8

Contd. ...

(3)

(b) A 60cm diameter well is being pumped at a rate of 1360 lit/min. At a distance of 6m from the well, the drawdown was 6m and at 15m the drawdown was 1.5m. The bottom of the well is 9m below the ground water table:

- Find out the coefficient of permeability.
- If all the observed points were on Dupuit Curve, what was the drawdown in the well during pumping?
- What is the specific capacity of the well?
- What is the maximum rate, which can be drawn from the well?

6(a) Define flood. What are the causes, effects and mitigation measures of the flood?

(b) An evaporation pan 1.2m diameter was used to find out the evaporation loss from the reservoir. The pan was initially filled with water up to a depth of 8cm. During the period of observation, a rainfall of 4cm was recorded. At the end of the observation, the depth of water in the pan was found to be 8.5cm. Taking pan coefficient=0.7, determine the evaporation from the reservoir. Take water spread of reservoir=20km².

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PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Fourth Semester/Chance

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG263CI: Engineering Hydrology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Define hydrology and explain its application in civil engineering fields. 2+6

(b) Calculate average rainfall over a catchment of area 8km² by three methods. 8

Station ID	Annual Rainfall (mm)	Isohetal		Polygon Area (%)
		Interval (m)	Area enclosed (sq. km)	
A	2256	1.80-2.00	1.25	15
B	2534	2.00-2.20	0.75	36
C	2123	2.20-2.40	3.15	21
D	1867	2.40-2.60	0.85	11
E	2000	2.60-2.80	2.0	22

2(a) Write down the steps with formula to calculate evapo-transpiration from Penman's method. 8

(b) For the Horton model, the infiltration rate at beginning of rainfall is 10cm/hr and decreased to 1cm/hr after 10hrs. A total of 70cm of water infiltrated during 10 hour period. Compute the value of 'K' of the Horton model? 8

3(a) How do you develop S-curve from D-h unit hydrograph? Explain its uses. 6

(b) The ordinates of 6-hr UH are given below:

Time (hrs)	0	3	6	9	12	15	18	21	24	27	30	33	36
6-hr OH ordinates	0	15	24	42	58	78	69	58	43	30	17	15	0

Contd. ...

$$F = F_c + (F_0 - F_c) e^{-k_c T} \quad (2)$$

A storm has successive 3 hr rainfall of 3, 5 and 4 cm respectively. Assuming a ϕ index of 0.20cm/hr and a base flow of 53 m³/sec, determine resulting flow hydrograph. 10

4(a) What is rating curve? Write down standard equation for rating curve. Explain in detail the procedure to estimate the parameters of the rating equation. 1+1+6

(b) Compute discharge of a stream by following data. A current meter with calibration equation $V = 0.30N + 0.032$ where V in m/sec and N is revolution/sec is used to measure the velocity. 8

Distance	0	2	4	6	8	10	12	14	16	18	20	22
Depth (m)	0	1	4.3	7.2	8.5	7.4	5.6	4.7	3.5	2.1	1.4	0
Revolutions/sec at 0.2d	0	3	4	6	6.5	7	6	5.5	5	3	2	0
Revolutions/sec at 0.8d	0	2	3	5	5.5	6.5	6.3	4.8	4	2.5	1.5	0

5(a) Describe various hydro-geomorphological characteristics of river. 8

(b) The flood discharges for 25 & 250 years from fitted Gumbel distribution are 90 and 500m³/sec respectively. Estimate flood magnitudes for 50, 500 and 1000 years by Gumbel's method analytically. 8

6(a) How is the double mass curve technique used to check the consistency and adjust the rainfall at a suspicious station? Explain with neat sketch. 8

(b) A well penetrating an unconfined aquifer 20m thick below water table is pumped at uniform rate of 600 ltr/min, till the water level in the well becomes steady. Two observation wells drilled radially at a distance of 20 and 80m from the centre of well, show depression of 3.2m and 1.1m respectively. Determine coefficient of permeability. 8

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PURBANCHAL UNIVERSITY

2013

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG263CI: Engineering Hydrology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Why do you think study of hydrology is important for civil engineer? Explain the components of hydrological cycle. 4+4

(b) There are four rain gauge stations existing in the catchment of a river, the average annual rainfall values at these stations are 800, 620, 400 and 540mm respectively. (i) Determine the optimum number of rain gauges in the catchment, if it is desired to limit the error in the mean value of rainfall in the catchment to 10% (ii) How many more gauges will then be required to be installed. 8

2(a) Define point rainfall. Explain the methods for finding the average rainfall. 2+6

(b) A catchment area of 30 km² has one recording gauge; during a storm the following mass curve of rainfall was recorded.

Time from start of storm (hour)	0	2	4	6	8	10	12	14
Accumulated rainfall (mm)	0	6	17	57	70	81	87	90

If the volume of the runoff due to the storm measured is $1.2 \times 10^6 \text{ m}^3$ estimate the Φ index of the catchment. 8

3(a) Derive the equation for potential evaporation from Penman method in which explaining the long wave radiation, short wave radiation, net radiation and solar radiatoll. 10

(b) What return period you would adopt in the design of a culvert on a drain if you are allowed to accept only 5% risk of flooding in the 25 years of expected life of the culvert? 6

Contd. ...

PURBANCHAL UNIVERSITY

2010

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG263CI: Engineering Hydrology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Define hydrology. Describe the scope of hydrology and its application to civil engineering. 2+4+2

(b) The isohyets drawn for a storm which occurred over a drainage basin of area 950Km² yielded the fallings:

Isohyet interval, mm	85-75	75-65	65-55	55-45	45-35
Area between isolayet Km ²	1250	236	264	175	150

Determine average depth of rainfall over the basin. 8

2(a) What are the factors affecting infiltration. The mass curve of a rainfall of duration 100mm is given below. If the catchment had an initial loss of 0.6cm and a ϕ index of 0.6cm/hr, calculate the total surface runoff from the catchment. 6+4

Time from rain start (min)	0	20	40	60	80	10
Cumulative rain (cm)	0	0.5	1.2	2.6	3.3	3.5

(b) A reservoir with a surface area of 250 hectare had the following average values of parameters during a week: water temperature = 20°C, relative humidity = 40%, wind velocity at 1.0m above ground = 16km/hr. Estimate the average daily evaporation from the lake and +ve volume of water evaporated from the lake during that week. 6

3(a) Elucidate the causes and effect of flood. 6

(b) From the analysis of available data on annual flood peaks of a small stream for a period of 35 years, the 50 year and 100 year flood have been estimated to be 660m³/s and 740m³/s using Gumbel's method. Estimate the 200 year flood for the stream for a record length of 35 years, $\bar{y}_n = 0.54034$ and $\sigma_n = 1.12847$.

Contd. ...

(2)

4(a) Discuss the points that are to be considered while selecting site for stream Gauging. 8

(b) During a high flow, water surface elevation of a small stream were noted at two sections A and B, 12 km apart and data are presented as below:

Section	Water Elevation (m)	Section Area (m ²)	Hydraulic Radius (m)
A	104.771	73.293	2.793
B	104.500	93.375	2.089

Calculate discharge of river by slope method. Take Manning's coefficient as 0.012. 8

5(a) A 50cm well completely penetrates an unconfined aquifer of saturated depth 40m. After a long period of pumping a steady rate of 500 lpm, the draw-down in two observation wells 2.5 and 7.5 from the pumping well were found to be 3.5m and 2.0m respectively. What is the drawdown at the pumping well. 8

(b) Describe any one type of recording raingauge with neat sketch. 8

6(a) A catchment has 6 rain gauge stations. In a year, the annual rainfall recorded by the gauges are as follows:

Station	A	B	C	D	E	F
Rainfall, cm	83	103	180	110	99	137

For a 10% error in the estimation of +ve mean rainfall, calculate the optimum number of stations in the catchment. 8

(b) Explain unit hydrograph with neat sketch. Also write limitations of unit hydrograph. 4+4



(2)

4(a) Define Infiltration. Explain the factor which influence it.

(b) Compute the stream flow for the measurements data given below.

Distance(m)	0	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0
Depth(m)	0	0.3	1.29	2.16	2.55	2.22	1.68	1.41	1.05	0.63	0.4
Velocity(m/s) at 0.2d	0	0.42	0.57	0.78	0.87	0.81	0.75	0.69	0.63	0.54	0.4
Velocity (m/s) at 0.8d	0	0.21	0.36	0.54	0.6	0.3	0.51	0.45	0.39	0.33	0.3

5(a) Define unit hydrograph. Explain its characteristics.

(b) The ordinate of 3 hour unit hydrograph of a catchment are given below.

Time (h)	0	3	6	9	12	15
Ordinate of 3 hour UH 3 (m ³ /sec)	0	10	20	16	12	4

Derive the flood hydrograph at the catchment outlet due to the storm below:

Time from start of storm (h)	0	3	6	9
Accumulated rainfall (cm)	0	3.9	4.7	7.6

Φ Index of the catchment as 0.3 cm/h and a constant base flow as 10m³/sec.

6(a) Explain the classification of river.

(b) Design a tube well in a confined aquifer for following data:

Required discharge = 160 lit/sec

Thickness of confined layer = 30.00m

Radius of influence = 300.00 m

Permeability co-efficient = 120.00 m/day

Drawdown = 5.0m

$$2 \frac{T(s_w)}{log(r/w)}$$

$$h_2 = 20$$

$$d.d. = 5$$

D

PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

HEQ262CI: Hydraulics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions.

5×16=80

- 1(a) Derive Darcy-Weisbach equation. Define and explain Hydraulic grade line and energy grade line? 4+4
- (b) For a viscous flow through a pipe of diameter 150mm, the maximum velocity is 3m/s. Find the mean velocity and the radius at which this occurs. Also calculate the velocity at 30mm from the wall of the pipe. 8
- 2(a) A siphon of diameter 170mm connects two reservoirs having a difference in elevation of 10m. The length of the siphon is 500 m and the summit is 3.5m above the water level in the upper reservoir. The length of the pipe from the upper reservoir to the summit is 90m. Determine the discharge through the siphon and also pressure at the summit. Neglect minor losses. The coefficient of friction= 0.0045. 8
- (b) Derive the expression for pressure rise for a sudden closure of the valve when the pipe is considered elastic. Describe any one relief devices constructed/installed against the action of water hammer. 4+4
- 3(a) Discuss about the Equivalent pipe? 4
- (b) Show that for the most economical trapezoidal open channel section, top width will be equal to twice the length of the sides. 6
- (c) The rate of flow of water through a circular channel of diameter 0.6m is 150 lps. Find the slope of the bed of the channel for maximum velocity. Take C=55. 6
- 4(a) Derive discharge equation for triangular notch/weir. 6

Contd. ...

(2)

- (b) A trapezoidal channel has side slopes 1:1. It is required to discharge $13.75 \text{ m}^3/\text{s}$ of water with a bed gradient of 1 in 1000. If unlined, the value of Chezy's coeff. is 44. If lined with concrete, its value is 60. The cost per m^3 of excavation is four times the cost per m^3 of lining. The channel is to be the most efficient one. Find whether the lined canal or the unlined canal will be cheaper. What will be the dimensions of that economical canal? 10
- 5(a) Derive governing equation of gradually varied flow and write the condition for backwater and drawdown profiles. 6+2
- (b) A rectangular channel 3m wide has a bed slope 0.0005. The discharge through the channel is $3 \text{ m}^3/\text{s}$. Estimate the distance between two sections if the depths of flow at upstream and downstream section are 0.8 m and 1.1 m respectively. Manning's coefficient will be assumed to be 0.015. 8
- 6(a) Write short notes on any TWO: 2×4=8
- (i) Differentiate between rigid and mobile boundary channel
 - (ii) Specific energy curve
 - (iii) Scale effects in model studies
- (b) Derive hydraulic jump equation and express it in terms of upstream Froude Number. 8

PURBANCHAL UNIVERSITY

2017

B.E. (Civil)/Fourth Semester/*Final*

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG262CI: Hydraulics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions.

5×16=80

- 1(a) Derive an expression for velocity distribution in pipes for a laminar flow? 8
- (b) An average velocity occurs at 7.07 cm from the pipe centre. If the velocity at 4cm from the pipe wall is 0.96 m/s, determine the average velocity. 8
- 2 (a) Water flows in a pipe of diameter 30cm. Whether the flow is laminar or turbulent, if the discharge through the pipe is 0.5 M³/s and head loss during the flow is 0.2m. Considering the pipe flow as hydrodynamically rough, determine the absolute roughness of the pipe. Kinematic viscosity of water is 10⁻⁶ m²/s. 8
- 6 (b) Determine the piezometric head of the junction of pipes connecting three reservoirs A, B and C. Water surface levels of reservoirs A, B and C are 70m, 60m and 50m respectively. Lengths and diameters of the pipes connecting A, B and C are 1500m, 1200m and 1000m, and 450mm, 350mm and 250mm. Friction factor of all pipes is assumed to be 0.02. 8
- 5 3(a) Derive Chezy's equation for an open channel flow. 6
- 5 (b) For the most economical trapezoidal channel section, show that top width of flow must be equal to twice the length of the channel side. 6
- 2 (c) List out advantages of triangular notch over rectangular notch. 4
- 3 4(a) For purpose of discharge measurement the width of a rectangular channel is reduced gradually from 3m to 2m and the floor is raised by 0.3m at a given section. When the approaching depth of flow is 2m, what rate of flow will be indicated by a drop of 0.15m in water surface elevation at the contraction section? 10

Contd. ...

(2)

- 3 (b) Classify and sketch all the possible water surface profiles? 6
- 5(a) Derive an expression to calculate flow depth after the hydraulic jump, based on upstream flow depth and upstream Froude Number. Apply the momentum equation to derive from basic. 8
- (b) A rectangular channel 7.5 m wide has uniform depth of flow of 2 m and has bed slope of 1 in 3000. If due to weir constructed at the downstream end of the channel, water surface at a section is raised by 0.75 m, determine the water surface slope. Assume Manning's $n = 0.02$. 8
6. Write short notes on any FOUR: 4x4=16
- (a) Distorted and undistorted model
- (b) Types of bed forms
- (c) Type of hydraulic jump
- (d) Notch ventilation
- (e) Equivalent pipe

$$h_f = \frac{V^2}{2gD}$$

$$\frac{1}{\sqrt{S}} = \frac{1}{\sqrt{S_0}} + 2 \log \left(\frac{R}{D} \right) + 0.72$$

$V = \frac{Q}{A}$
 $f_6 = \frac{1}{\sqrt{gH}}$

Assume
steady

$$\frac{1}{\sqrt{S}} = 2 \log \left(\frac{R}{D} \right) + 0.72$$

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5×16=80

- 1(a) The water levels in the two reservoirs A and B are respectively 66m and 61.5m above datum. A pipe joins each to a common point D where the pressure is 103 kN/m² gauge and height is 45m above datum. Another pipe connects D to another tank C. What will be the height of water level in C assuming the same value of friction factor for all pipes? 8
- (b) Derive the equation for frictional head loss in turbulent flow. 8
- 2(a) A pipe line, 16 km long, supplies, 40 millions liters of water per day to city. The first 5 km length of the pipe is of 1m diameter and the remaining part is 0.8m diameter pipe. If the water to the city is to be supplied at a residual head of 15m of water, calculate the supply head at the inlet end. Neglect minor losses and assume $f=0.03$ for the entire pipe line. Neatly sketch the hydraulic gradient for the pipe line. 8
- (b) What is a syphon? Prove the pressure at the summit of a syphon is negative. 4+4
- 3(a) A water main of concrete pipe 3200m long and 0.3m diameter discharges into a reservoir at the rate of 10×10^6 litres per day. If this line is gradually closed by operating a valve at the reservoir end in 16 seconds, show that there is a possibility of pipe burst. The safe pressure of concrete pipe is 245.25 kN/m². 8
- (b) Classify open channel with respect to time, space and hydraulic regime. Critically show the difference between pipe flow and open channel flow. 4+4

Contd.

(2)

- 4(a) Derive the equation for most economical trapezoidal sections. 8
- (b) For purpose of discharge measurement the width of a rectangular channel is reduced gradually from 3m to 2m and the floor is raised by 0.3m at a given section. When the approaching depth of flow is 2m, what rate of flow will be indicated by a drop of 0.15m in water surface elevation at the contracted section? 8
- 5(a) Describe Shield's approach of predicting critical tractive stress. 6
- (b) Water flows from an under sluice into a very wide rectangular channel. The channel has a bed slope of 1 in 1000. The sluice is regulated to discharge 6 cumec per metre width of channel, the depth at venacontracta being 0.5m. Will a hydraulic jump form? If so determine its location. Use a single step for the computation with Manning's $n=0.015$. 10
6. Write short notes on: 4x4=16
- (a) Scale effect in model studies
 - (b) Types of weir
 - (c) Condition of uniform flow
 - (d) Laws of fluid friction

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PURBANCHAL UNIVERSITY
2016

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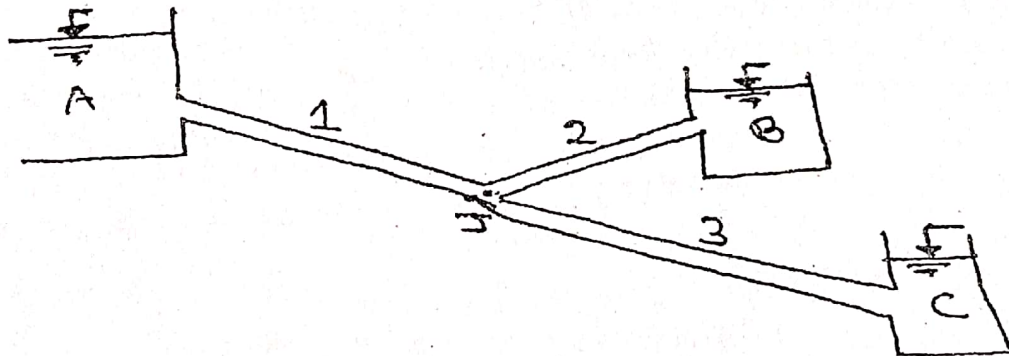
Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

5×16=80

Answer FIVE questions.

- 1(a) What do you understand by Laminar and turbulent flow? Describe laws of fluid friction for laminar and turbulent flow with necessary sketch. 2+6
- (b) In figure below pipe 1 is 30cm diameter and 900m long, pipe 2 is 20cm diameter and 250m long, and pipe 3 is 15cm diameter and 700m long. The friction factor for all pipes is 0.03. The surface elevations of reservoirs A, B, and C are 160m, 150m, and 120m respectively. Does the water enter or leave reservoir B? Also find the flow rate in each pipe. 8



- 2(a) List factors affecting magnitude of pressure rise/fall due to water hammer. Describe physical phenomena of water hammer due to instantaneous closure of valve at the end of constant diameter pipe. 2+6
- (b) Differentiate between pipe flow and open channel flow? Illustrate the classification of slopes. 4+4

Contd. ...

(2)

- 3(a) Derive fundamental equation of uniform flow in open channel. 8
- (b) Why notch ventilation is important? Describe briefly. Find the percent error in Q if there is a 1° error in the measurement of the total vertex angle of a triangular weir having a total vertex angle of 60° . 3+5
- 4(a) Derive necessary expression for maximum discharge to pass under moveable sluice gate installed across rectangular channel. 8
- (b) Describe characteristics of subcritical, critical and supercritical flow in rectangular channels. 8
- 5(a) A rectangular flume of timber ($\eta=0.013$) is 1.6m wide and carries 1.7 cumecs of water. The bed slope is 0.0005, and at a certain section the depth is 1.0m. Find the distance (one step) to the section where depth is 0.85m., is the distance upstream or downstream. 6
- (b) Water flows over the crest of a 1:30 model spillway, and the velocity measured at a particular point is 0.4 m/s. What velocity does this represent in the prototype? The force exerted in a certain area of the model is measured to be 0.15N. What would be the force on the corresponding area in the prototype? Develop your own dimensionless ratios. 10
6. Write short notes on any FOUR: 4×4=16
- (a) Conditions for continuous supply for syphon
 - (b) Critical tractive force approach
 - (c) Hydrodynamically smooth flow
 - (d) Types of Jump
 - (e) Concept of specific forces

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Fourth Semester/Final

Full Marks: 80/Pass Marks: 32

Time: 03:00 hrs.

BEG262CI: Hydraulics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

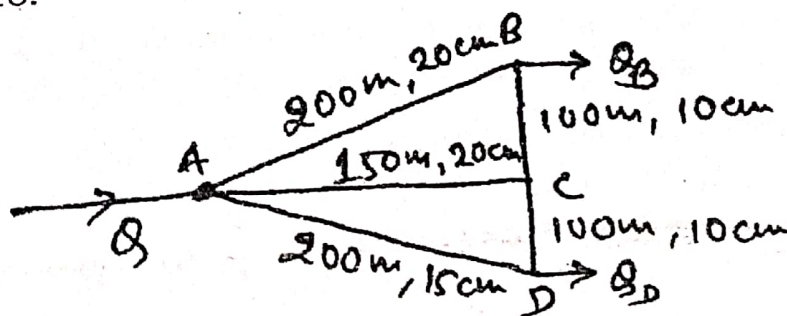
All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions. Q. No. (4) and (5) are compulsory. $5 \times 16 = 80$

1(a) Derive the Hazen poisseuille Equation of instantaneous velocity for laminar pipe flow and also find out the position of average velocity in pipe flow. 4+4

(b) Water flows through a pipe diameter 75mm at Reynolds number 80000. The pipe is commercial with absolute roughness of 0.10mm. What head loss is to be expected in 0.3km length of this pipe? 8

2(a) A pipe network is shown in figure below. The water flows out from point B and D to the atmosphere. Pressure at point A is 70 kpa. Find out Q , Q_B and Q_D . The pipe are of same material of $f=0.018$. 10



(b) What is summit point in siphon? Write down the expression for summit pressure in siphon. 2+4

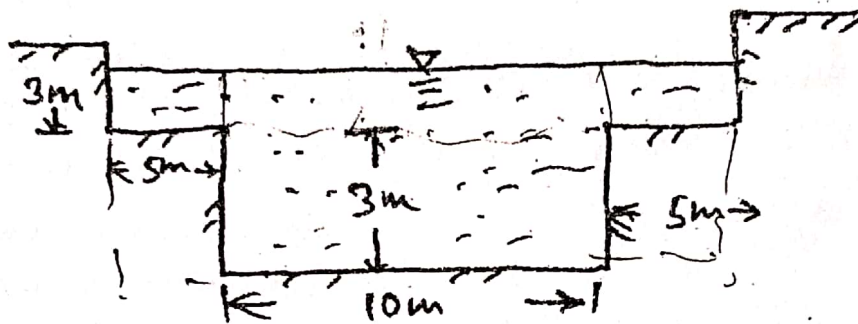
3(a) Derive the Euler's equation for unsteady flow in pipe from first principle. Write down the equations for rise in pressure at gradual and rapid closing of gate in pipe flow. 7+3

Contd. ...

(2)

(b) What are condition for uniform flow in open channel? Show the relationship between chezy, darcy and Manning's coefficient in open channel flow. 3+3

4(a) The cross section of a straight river is approximated as shown in figure below. At what depth will $100 \text{ m}^3/\text{sec}$ of water flow? The bed slope is 0.001 and Manning's n 0.022. 8



(b) Derive the momentum equation for non uniform flow in open channel. 8

5(a) A rectangular channel conveying a discharge of $30 \text{ m}^3/\text{sec}$ is 12 m wide with bed slope 1 in 6000 and Manning's $n=0.025$. The depth of flow at a section is 1.5m. How far upstream or downstream the depth of flow will be 2m? Find also the type of profiles. Use direct step method and take only three steps for calculation. 8

(b) What is incipient motion in mobile boundary channel? Write the procedure to design the channel in alluvial soil. 2+6

6 Write short notes on any TWO: 8+8

(a) Hydraulic jump in open channel flow

(b) Modeling and Model laws

(c) Rectangular and Triangular notches

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FURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Fourth Semester/Final

Full Marks: 80/Pass Marks: 32

Time: 03:00 hrs.

BEG262CI: Hydraulics

Candidates are required to give their answers in their own words as far as practicable.

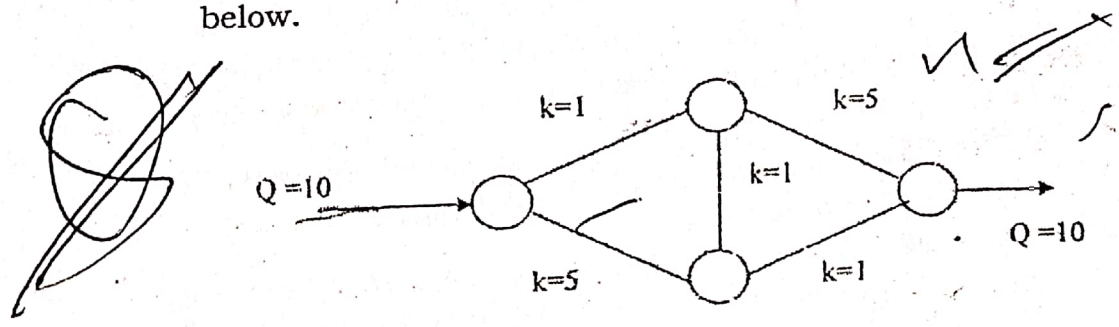
All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt data suitably (if required).

Answer FIVE questions.

1(a) Derive Darcy-Weisbach Equation. 8

(b) A horizontal pipe 60mm in diameter conveys oil of specific weight 9200N/m^3 . The pressure difference between two sections 8m apart is found to be 20000N/m^2 . The oil flowing in the pipe is collected in a weighing tank. It is found that 7020 N of oil is collected in 4 minutes. Find the dynamic viscosity of oil. 8

2(a) Calculate the flow through each of the pipe of network as shown below. 8



(b) A 900 mm diameter steel pipe carries water at the rate of $1.5\text{m}^3/\text{s}$. The pipe wall has thickness of 1 cm. The elastic modulus of steel is $2.11 \times 10^6\text{ kg/cm}^2$ and the bulk modulus of water is $2.15 \times 10^4\text{ kg/cm}^2$. Determine the increase in pressure if the valve at the end of 3.5 km long pipeline is closed in 3.5 seconds. 8

3(a) Differentiate between open channel flow and pipe flow. Describe different shapes of open channels. 4+4

Contd. ...

(2)

(b) A trapezoidal channel carries $142 \text{ m}^3/\text{sec}$ of water and is designed to have a minimum cross-section. Find a bottom width and depth if the bed slope is 1 in 1200 and side slope is 45 degrees. Take $C = 35$. 8

4(a) Water flows through a triangular right-angled weir first and then over a rectangular weir of 1m width. The discharge co-efficient of the triangular and rectangular weirs are 0.6 and 0.7 respectively. If the depth of water over the triangular weir is 360 mm, find the depth of water over the rectangular weir. 8

(b) Derive specific force Equation for non uniform flow in open channel from basics. 8

5(a) The discharge of water through a rectangular channel of width 8m, is $15 \text{ m}^3/\text{sec}$ when depth of flow of water is 1.2m. Calculate:

(i) Specific energy of the flowing water,

(ii) Critical depth and critical velocity and

(iii) Value of minimum specific energy. 2+4+2

(b) List all the methods of solving Gradually Varied Flow and describe at least one with neat sketches. 2+6

6(a) What are uses of hydraulic jump? Prove that energy loss in the jump as by $\frac{(y_2 - y_1)^3}{4y_2y_1}$ 8

(b) Write short notes on any TWO: 4+4

(a) Surge Tank

(b) Model and advantages of model testing

(c) Syphon and its uses.

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PURBANCHAL UNIVERSITY

2014 (Old)

B.E. (Civil)/Fourth Semester/Chance

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG262CI: Hydraulics

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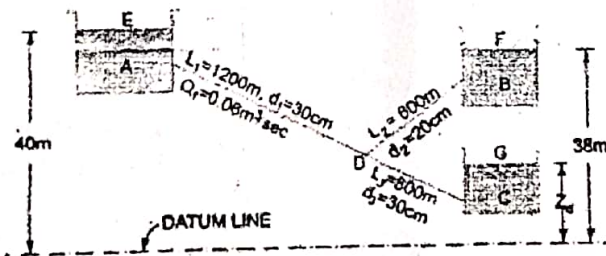
Answer FIVE questions.

1(a) Explain boundary layer theory. Define displacement, momentum thickness and energy thickness and derive their respective expressions. 8

(b) A laminar flow is taking place in a pipe of diameter of 200 mm. The maximum velocity is 1.5 m/s. Find the mean velocity and the radius at which it occurs. Also calculate the velocity at 4cm from the wall of the pipe. 8

2(a) Enumerate the various losses in pipe flow. Derive loss due to sudden contraction of pipe diameter. 6

(b) Three reservoirs A, B and C are connected in a pipe system shown in figure below. Find the discharge into or from the reservoir B and C if the rate of flow from the reservoir A is 60 lit/sec. Find the height of water level in the reservoir C. Take $f = 0.006$ for all pipes. 10



3(a) Explain the phenomena of water hammer. How do you define

Contd. ...

PURBANCHAL UNIVERSITY

2013

B.E. (Civil)/Fourth Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG262CI: Hydraulics

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt data suitably (if required).

Answer FIVE questions.

1(a) Derive the relation $\tau = -\frac{r}{2} * \gamma * \frac{\partial h}{\partial x}$ for laminar flow in circular pipes. 8

573
(b) A pipe of diameter 20cm and length 2000m connects two reservoirs, having difference of water levels as 20m. Determine the discharge through the pipe. If an additional pipe of diameter 20cm and length 1200 is attached to the last 1200m length of the existing pipe, find the increase in the discharge. Take $f = 0.015$ and neglect minor losses. 8

2(a) What is siphon? Where is it used? Derive necessary expressions for inlet leg and outlet leg of a siphon. 1+2+5

(b) Water is flowing with a velocity of 1.5 m/s in a pipe of length 2500m and of diameter 500mm. At the end of the pipe, a valve is provided. Find the rise in pressure if
(i) The valve is closed in 25 seconds,
(ii) The valve is closed in 2 seconds. (7.2-1) * 6 =

Take velocity of sound waves $C = 1460$ m/s assume the pipe to be rigid. 8

3(a) Derive the necessary conditions for the triangular channel to be hydraulically efficient. 8

(b) Find the discharge through a trapezoidal channel of width 6 and side slope of 1 horizontal to 3 vertical. The depth of flow of water is 3m and Chezy's constant = 60. The channel bed slope is 1 in 5000. 8

Contd. ...

(2)

- 4(a) What are the differences between pipe flow and open channel flow? Also differentiate hydrodynamic rough and smooth flow. 4+4
- ✓ (b) The discharge of water through a rectangular channel of width 8m, is $15\text{m}^3/\text{s}$ when depth of flow of water is 1.2m upstream of contraction width 5m neglect losses. Calculate:
- 1635
- (i) Specific energy of the flowing water at contraction
 - (ii) Critical depth and critical velocity, at contraction
 - (iii) Specific energy with no backwater at contraction
- 5(a) What is critical flow? Derive the expressions for critical depth and critical velocity in trapezoidal channel. 1+4+3
- ✓ (b) A rectangular flume 2m wide carries discharge at the rate of $2\text{m}^3/\text{s}$. The bed slope of the flume is 0.0004. At a certain section, the depth of flow is 1m. Calculate the distance of the section downstream where the depth of flow is 0.9m. Solve by direct step method. Assume Manning's coeff. $(n) = 0.014$. 8
- 6(a) Write short notes on any TWO: 4+4
- (i) Geometric, Kinematic and Dynamic Similarities
 - (ii) Distorted and Undistorted Models
 - (iii) Incipient Motion and Critical Tractive Stress
- ✓ (b) The depth of flow of water, at a certain section of a rectangular channel 2m wide, is 0.3 m. The discharge through the channel is $1.5\text{m}^3/\text{s}$. Determine whether a hydraulic jump occurs, and if so, find its height, length and loss of energy due to jump. 8
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- D?

(2)

- sudden and gradual closure of a valve? Derive an expression for pressure rise when the following water in pipe is brought to rest by closing the valve gradually. 8
- ✓ (b) A trapezoidal channel having bottom width 5m and side slope one horizontal to two vertical (1H:2V) is constructed with bottom slope in 1 in 1000. If Manning's coefficient of the channel is 0.013, what will be the discharge through the channel when the depth of flow is 2.5 m. Also find the section-factor of the channel. 8
- 4(a) ✓ Derive the condition for side slope and hydraulic mean radius for most economical triangular channel section. 8
- ✓ (b) A rectangular Channel 4 m wide has depth of water 2.5m. The slope of the bed of channel is 1 in 1000 and Chesy's constant $C = 55$. It is desired to increase the discharge to a maximum by changing the dimension of the section for constant area of cross section, slope of bed and roughness of channel and increase in discharge. 8
- 5(a) ✓ Explain specific energy and specific energy curve in brief. Derive the expression for critical depth. 8
- ✓ (b) A sluice gate discharge water into a horizontal rectangular channel with a velocity of 6m/s and depth of flow is 0.4m. The width of rectangular channel is 8m. Determine whether the hydraulic jump will occur, and if so, find height of hydraulic jump and total loss of energy. Also determine the depth of water level after jump. 8
6. Write short note on any FOUR: 4+4
- (a) Difference between pipe flow and open channel flow
 - (b) Siphon
 - (c) Bed forms of mobile boundary channel
 - (d) Importance of model studies
 - (e) Types of jump
- ≈

PURBANCHAL UNIVERSITY

2012

56
80

B.E. (Civil)/Fourth Semester/Final

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BEG262CI: Hydraulics

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Answer FIVE questions.

- 1(a) What is boundary layer thickness and momentum thickness? Calculate the ratio of momentum thickness to boundary layer thickness if the velocity distribution in the boundary layer is given by $u/U = 1.5 y/\delta - 0.5 y^2/\delta^2$, δ being boundary layer thickness. 6
- (b) When a sudden contraction is introduced in a horizontal pipeline from 500mm diameter to 250mm diameter, the pressure changes from 105 KN/m² to 69 KN/m². If the coefficient of contraction is 0.6, calculate the water flow rate. Contrary to this, if there is a sudden enlargement from 250 mm to 500mm and if the pressure at 250mm section is 69KN/m², what would be the pressure at the 500mm enlarged portion? 10
- 2(a). What is water hammer? Explain process of pressure cycle in pipe flow. 1+5
- (b) The water levels in the two reservoirs A and C are 104m and 9m respectively above the datum. A pipe joins each to a common point D. Another pipe connects D to another reservoir B. The flow rate of water between junction D and reservoir B is 0.4m³/s. Determine the elevation of water surface in reservoir B and flow rate of water between junction D and reservoir C and between junction D and reservoir A. Take $f=0.025$ for all three pipes. The diameter of the pipes AD, BD, and CD are 300mm, 400mm, and 600mm respectively and their lengths are 250m, 280m and 310m respectively. 10
- 3(a) Why is bed slope provided in an open channel? Explain uniform and non-uniform flow with possible conditions of occurrence in open channel flow. 1+5

(2)

(b) The normal depth of flow of water in a rectangular channel 1.5m wide is one metre. The bed slope of the channel is 0.0006 and Manning's roughness coefficient $n=0.012$. At a certain section of the same channel the depth is 0.92m while at a second section the depth is 0.86m. Find the distance between two sections and slope of water surface. 10

4(a) What is a suppressed weir? Explain the purpose of providing ventilation on suppressed weir with neat sketches. 1+5

10 (b) A trapezoidal channel is required to carry $8\text{m}^3/\text{s}$ of water at a velocity of $2\text{m}/\text{s}$. Find the most economical cross section if the channel has side slopes 1 horizontal to 2 vertical. For the same discharge what saving in power would result if this trapezoidal section is replaced by a rectangular section of 1.5m deep and 4m wide. Take Chezy's constant $C=50$. 10

3 5(a) What is specific energy? Discuss briefly about the specific energy curve. 1+5

10 (b) Two reservoirs having a difference in elevation of 15m are connected by a 200mm diameter siphon. The length of siphon is 400m and the summit is 4m above the upper reservoir. If inlet leg is 100m long and $f=0.02$, calculate: (i) maximum discharge through the siphon and (ii) pressure at the summit. - 8.125 10

12. 6. Write short notes on any FOUR: 4×4=16

(a) Various Bed forms in Mobile Boundary Channel

(b) Undistorted and Distorted model

(c) Hydraulic Jump

(d) Hydraulic Gradient Line and Total Energy Line

(e) Laminar and Turbulent flow

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