

PURBANCHAL UNIVERSITY

2018

B.E. (Civil/Computer/E. & C./Electrical Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG102SH: Mathematics-II (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.

16×5=80

1. Find the equation of the plane through the intersection of the planes $2x + 3y + 10z = 8$, $2x - 3y + 7z = 2$ and perpendicular to the plane $3x - 2y - 4z = 5$.
2. Find the equation of the straight through the point (1,2,3) and parallel to the line of intersection of the planes $x - 2y + z = 3$ and $4x + 4y - 5z = 2$.

Or

Find the equation of perpendicular from the point (2, 4, -1) to the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$. Also obtain the foot of the perpendicular.

3. Find the shortest distance between the lines $\frac{x}{2} = \frac{y}{-3} = \frac{z}{1}$ and $\frac{x-2}{3} = \frac{1-y}{5} = \frac{z+2}{2}$. Find also the equation of the shortest distance.
4. Obtain the equation of the sphere which passes through the circle $x^2 + y^2 = 4$, $z = 0$ and is cut by the plane $x + 2y + 2z = 0$ is a circle of radius 3.

Or

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Find the equation of the cone with vertex at (α, β, γ) and base

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, z = 0.$$

- Define and find the equation of cycloid in parametric form.
- Find the eccentricity, directrix and identify the conic section and hence sketch the graph of the polar equation $r = \frac{6 \sec \theta}{2 \sec \theta + 6}$.

Or

Find the area of the surface generated by the revolution of the curve $r = 2(1 + \cos \theta)$ about the polar axis.

- If $\phi = x^3 + y^3 + z^3 - 3xyz$, Find $\text{div}(\text{grad } \phi)$ and $\text{cur}(\text{grad } \phi)$.

- If $\vec{r} = 2t^2\vec{i} + t\vec{j} - 3t^3\vec{k}$, evaluate $\int_1^2 \left(\vec{r} \times \frac{d^2\vec{r}}{dt^2} \right) dt$.

- If \vec{a} and \vec{b} are constants, and $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$, prove that $\text{curl}[\vec{r} \times (\vec{a} \times \vec{b})] = 2\vec{b} \times \vec{a}$. 2016

Or

Find the value of n so that vector $r^n \vec{r}$ is solenoidal.

- Applying integral test to test the convergence of series

$$\sum_{n=1}^{\infty} \frac{1}{n^2 + n}$$

Or

Discuss the convergence of series. $\sum (\sqrt[3]{n^3 - 1} - n)$.

- Determine the interval, radius and centre of convergence of the

power series: $\sum_{n=1}^{\infty} \frac{2^n (x-3)^n}{n+3}$

(3)

- Solve: $\frac{dy}{dx} + \frac{2x-y+1}{2y-x-1} = 0$.

- Solve: $xy - ydx = x\sqrt{(x^2 - y^2)}dx$.

- Solve: $(D^2 + 4)y = x^2 \sin x$.

Or

Solve: $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 2y = x \log x$

- Solve the initial value problem:

$$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 0 \text{ where } y = 0, \frac{dy}{dx} = -3 \text{ when } x = 0.$$

- Use the power series method to solve $y'' + xy = 0$.

Or

Prove that: $J_{3/2}(x) = \sqrt{\frac{2}{\pi x}} \left(\frac{\sin x}{x} - \cos x \right)$.

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PURBANCHAL UNIVERSITY

2017

B.E. (Civil/Computer/E. & C./Electrical Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG102SH: Mathematics-II (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.

16×5=80

1. Find the equation of the plane which passes through the line of intersection of the planes $x + 5y - 2z = 6$ and $5x - 4y + 5z = 2$ and parallel to the line joining the points $(5, 1, 4)$ and $(-4, 2, 3)$.

Or

Find the locus of the point which moves such that the sum of the square of the distance of a point from the three planes $x+y+z=0$, $x+2y=0$ and $x-y+2z=0$ is 5.

2. Reduce the equation of line $x+2y+3z-6 = 3x+4y+5z-2$ in symmetrical form.

3. Find the shortest distance between the lines $\frac{x-3}{2} = \frac{y-4}{3} = \frac{z-5}{4}$ and $\frac{x-4}{3} = \frac{y-5}{4} = \frac{z-6}{5}$. Also find the equation of the shortest distance.

4. Obtain the equation of the sphere which passes through the circle $x^2+y^2=4$, $z=0$ and is cut by the plane $x+2y+2z=0$ is a circle of radius 3.

Or

Find the equation of the cone with vertex at (α, β, γ) and base

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1, z = 0.$$

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5. Prove that the surface area of sphere of radius 'r' is $4\pi r^2$

Or

Prove that $r = \frac{ed}{1 + e \cos \theta}$, where the symbols have their usual meanings.

6. Find the area of the surface generated by revolving the curve $x = 2at, y = at^2, (0 \leq t \leq a)$ about y-axis.

7. Define an infinite series. Prove that the convergence of infinite series implies $\lim_{n \rightarrow \infty} u_n = 0$.

Or

Test the convergence of the series $\frac{x}{1.2} + \frac{x^2}{2.3} + \frac{x^3}{3.4} + \frac{x^4}{4.5} + \dots, x > 0$.

8. Determine the interval, radius and centre of convergence of the power series $\sum \frac{3^n x^n}{(n+1)^2}$.

9. Find n so that the vector $r^n \vec{r}$ is solenoidal.

10. Find the directional derivative of $\phi = \frac{x}{x^2 + y^2}$ along a line making an angle 30° with the positive x-axis at (0,2).

Or

Prove that: $\text{div}(\vec{u} \times \vec{v}) = (\text{curl } \vec{v}) \cdot \vec{u}$

1. If $\phi = x^3 + y^3 + z^3 - 3xyz$, find $\text{div}(\text{grad } \phi)$ and $\text{curl}(\text{grad } \phi)$

2. Solve the following differential equation:
 $(2x + y + 1)dx + (4x + 2y - 1)dy = 0$.

3. Solve: $(1 + y^2) \frac{dx}{dy} + x = e \tan^{-1} y$. $e^{\tan^{-1} y}$

(3)

14. Solve: $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + y = xe^x \sin x$.

Or

Solve: $x^2 \frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + 6y = x$

15. Solve the initial value problem:

$y'' - 2y' + (\pi^2 + 1)y = 0$ given that $y(0) = 1, y'(0) = 1 - \pi$.

16. Solve the power series method $\frac{d^2 y}{dx^2} + x^2 y = 0$.

Or

Prove that: $xJ'_n(x) = -nJ_n(x) + xJ_{n-1}(x)$.

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PURBANCHAL UNIVERSITY

2016

B.E. (Civil/Computer/E. & C./Electrical Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 35

BEG102SH: Mathematics-II (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.

16x5=80

1. The plane $x + 3y + 5z - 7 = 0$ is rotated about its line of intersection with the plane $x - 2y - 6z - 8 = 0$ through a right angle. Find the equation of the plane in its new position.
2. Find the distance of the point $(3, -4, 5)$ from the plane $2x + 5y - 6z = 16$ measured along a line with direction cosines proportional to $2, 1, -2$.

Or

Show that the lines $\frac{x}{1} = \frac{y-2}{2} = \frac{z+3}{3}$ and $\frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4}$

are coplanar. Also find the equation of plane in which these lines lie.

3. Find the magnitude and the equation of the shortest distance between the skew-lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{j}$ and $2x - 3y + 27 = 0$
 $= 2y - z + 20$.

4. Find the equation of the sphere which passes through the points $(0, -2, -4)$ and $(2, -1, -1)$, and whose centre lies on the line $5y + 2z = 0 = 2x - 3y$.

Or

Contd. ...

(2)

Find the equation of the cone with vertex at (α, β, γ) and base $y^2 = \alpha x; z = 0$.

5. Find the polar equation of a conic section with its focus at the pole.

Or

Find the area of the surface generated by revolving the curve

$$x = a(t - \sin t), \quad y = a(1 - \cos t); \quad 0 \leq t \leq 2\pi \text{ about } x\text{-axis.}$$

5. Find the area of the region bounded by the closed curve $r = 1 - \cos \theta$.

Test the convergence of the series $\sum_{n=1}^{\infty} \frac{n}{1+n\sqrt{n+1}}$.

Or

Show that the hyper-harmonic series $\sum \frac{1}{n^p}$ Converges if $p > 1$ and diverges if $p \leq 1$.

Find the interval, radius and centre of convergence of the power

$$\text{series } x - \frac{x^2}{\sqrt{2}} + \frac{x^3}{\sqrt{3}} - \frac{x^4}{\sqrt{4}} + \dots$$

The position vector of a moving particle at any time t is given by $\vec{r} = a(t - \sin t)\vec{i} + a(1 - \cos t)\vec{j}$. Find the velocity and acceleration of the particle at $t = \pi/4$.

Find the constants a, b, c so that the vector

$$\vec{v} = (x+2y+az)\vec{i} + (bx-3y-z)\vec{j} + (4x+cy+2z)\vec{k} \text{ is irrotational.}$$

(3)

11. Using gradient of scalar functions find the angle between surfaces $x^2+y^2+z^2=9$ and $x^2+y^2-z=3$ at the point $(2, -1, 2)$.

Or

If $r = xi + yj + zk$, and \vec{a}, \vec{b} are constant vectors, show that $\text{curl}[\vec{r} \times (\vec{a} \times \vec{b})] = 2\vec{b} \times \vec{a}$.

12. Solve the differential equation: $x \frac{dy}{dx} = y + y \tan\left(\frac{y}{x}\right)$.

13. Solve the differential equation: $\frac{dy}{dx} + \frac{y}{x} = xy^2$.

Or

Define exact differential equation, solve

$$x dy - y dx = x \sqrt{x^2 - y^2} dx.$$

14. Solve the differential equation: $(D^2 - 4D + 3)y = e^x \cos 2x$.

Or

Solve the differential equation: $(x^2 D^2 - 2x D - 4)y = x^4$.

15. Solve the initial value problem:

$$y'' + 4y' + 5y = 0, \quad y(0) = 0, \quad y'(0) = -3.$$

16. Use the power series method to solve: $(1-x)y' - y = 0$.

Or

Prove that: $J_3(x)dx + J_2(x) + \frac{2}{x}J_1(x) = 0$, where J_n have their usual meanings.

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PURBANCHAL UNIVERSITY

2015

B.E. (Civil/Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG102SH: Mathematics-II (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.

1. Find the equation of the plane through the points (-1, 1, -1) and (6, 2, 1) and perpendicular to the plane $2x + y + z = 5$.

2. Find the image of the point (1, 3, 4) in the plane $2x + y + z + 3 = 0$.

Or,

Find the distance of the point (1, -2, 5) from the plane $x - 3y + 5z - 3 = 0$ measured parallel to $\frac{x}{3} = \frac{y}{-2} = \frac{z+3}{4}$.

3. Find the length of the shortest distance line between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$, $2x - 3y + 27 = 0 = 2y - z + 20$.

4. Find the equation of the sphere having the circle $x^2 + y^2 + z^2 = 9$, $x - 2y + 2z = 5$ as the great circle.

Or,

Find the equation of the cylinder whose generators are parallel to the line $\frac{x}{1} = \frac{y}{-2} = \frac{z}{3}$ and passing through the curve $x^2 + 2y^2 = 1$, $z = 0$.

5. Find the surface area generated by revolving the curve $x = 3t^2$, $y = 2t^3$; ($0 \leq t \leq 1$) about y-axis.

Contd. ...

(2)

Or

Find the length of the curve $r = \cos^2 \frac{\theta}{2}$.

6. Identify and sketch the polar curve $r = \frac{12}{6 + 2\sin\theta}$. Also find its eccentricity and directrix.

7. Test the following series for convergence $\frac{x}{1.2} + \frac{x^2}{2.3} + \frac{x^3}{3.4} + \dots$

Or

Apply integral test to test the convergence of the series

$$\sum_{n=1}^{\infty} \frac{1}{(3-2n)^2}$$

8. Find the interval, radius and centre of convergence of the series

$$\sum_{n=1}^{\infty} \frac{1}{(3+2n)^2}$$

9. If $\vec{r} = e^{ct} \vec{a} + e^{-ct} \vec{b}$ where \vec{a}, \vec{b} are constant vectors and c is a constant, show that $\frac{d^2 \vec{r}}{dt^2} - c^2 \vec{r} = \vec{0}$.

10. Prove that: $\text{div}(\vec{u} \times \vec{v}) = \vec{v} \cdot (\text{Curl} \vec{u}) - \vec{u} \cdot (\text{Curl} \vec{v})$ where, \vec{u} & \vec{v} are vector point functions.

11. Find the directional derivative of the function $\phi = x^2 - y^2 + 2z^2$ at the point $P(1, 2, 3)$ in the direction of the line \overline{PQ} where the point Q is $(5, 0, 4)$.

Or

Find the gradient of the scalar function $\psi = \log(\sin^{-1} r)$ where

$$\vec{r} = x\vec{i} + y\vec{j} + z\vec{k} \text{ and } |\vec{r}| = r.$$

(3)

12. Solve: $\frac{dy}{dx} = \frac{3xy + y^2}{3x^2}$

Or

$$(x+y+1)^2 \frac{dy}{dx} = 1$$

13. Solve: $(1+x^2) \frac{dy}{dx} + 2xy = \frac{1}{(1+x^2)^2}$

14. Solve: $(D^2 - 6D^2 + 11D)y = e^{-2x} + 3^{-3x}$.

Or

$$(D^2 + 3D + 2)y = e^{2x} \sin x.$$

15. Solve the following initial value problem:

$$y'' + 2y' + (\pi^2 + 1)y = 0 \text{ given that } y(0) = 1 \text{ and } y'(0) = 1 - \pi.$$

16. Solve the differential equation by power series method: $(x +$

Or

$$\text{Prove that: } xJ'_n(x) = nJ_n(x) - xJ_{n+1}(x).$$

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PURBANCHAL UNIVERSITY

2015

B.E. (Civil/Computer/E. & C./Electrical)/Second Semester/Final/Chance/Back

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG102SH: Mathematics-II

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

All questions carry equal marks.

Answer ALL questions.

1. Solve: $\frac{dy}{dx} + \frac{y}{x^2} = \frac{1}{x^2}$

Or,

Solve: $x dy - (y + x^2 \log x) dx = 0$

2. Solve: $(1 + x^2) \frac{dy}{dx} + 2xy = 4x^2$

3. Solve: $\frac{d^2 y}{dx^2} + 5 \frac{dy}{dx} + 6y = 0$

Or,

Solve: $(x^2 D^2 - 2xD + 2)y = 4x^3$

4. Solve: $(D^2 - 4D + 3)y = 10e^{-2x}$ given that $y=1$ & $Dy=3$ when $x=0$.

5. Solve the differential equation by power series method:

$$\frac{d^2 y}{dx^2} + 4 \frac{dy}{dx} = 0.$$

Or,

Prove the Bessel's functions: $J_{\frac{5}{2}}(x) = \sqrt{\frac{2}{\pi x}} \left\{ \frac{3-x^2}{x^2} \sin x - \frac{3}{x} \cos x \right\}$

Contd. ...

(2)

6. Find the equation of the plane which is perpendicular to plane $5x+3y+6z=0$ and which contains the line of intersection of the planes $x+2y+3z=0$ and $2x+y-z+5=0$.
7. Find the distance of the point $(-1, -5, -10)$ from the point of intersection of the lines $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane $x-y+z=5$.

Or,

Show that the lines $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ & $\frac{x}{1} = \frac{y-7}{-3} = \frac{z+7}{2}$

are co-planar. Also, find the equation of the plane containing them.

8. Find the shortest distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ & $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$. Find also the equation of shortest distance.

9. Find the equation of the sphere having the circle $x^2 + y^2 + z^2 = 9$, $x - 2y + 2z = 5$, as a great circle. Determine its centre & radius.

10. Find the points on the curve $x = 4t^2$, $y = t^3 - 12t$, $t \in \mathbb{R}$ at which the tangent is horizontal & vertical. Also find the equation of tangent at $t=1$.

Find eccentricity, identify the conic & directrix & hence sketch the graph of following polar equation of conic section

$$r = \frac{10}{3 + 2\cos\theta}$$

Or,

Find the length of the curve $r = 2(1 - \cos\theta)$.

(3)

12. Test for convergence of the series

$$3 + \frac{3}{4} + \frac{3}{4^2} + \dots + \frac{3}{4^{n-1}} + \dots$$

Or,

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \frac{1}{9} + \dots + \frac{1}{2^{n-1} + 1} + \dots$$

13. Find the interval & radius of convergence of the power series

$$\sum \frac{(x+2)^n}{3^n n}$$

14. Prove that $\frac{d}{dt} \left(\frac{-d\vec{r}_2}{r_1} - \frac{d\vec{r}_1}{r_2} \right) = \vec{r}_1 \frac{d^2 \vec{r}_2}{dt^2} - \frac{d^2 \vec{r}_1}{dt^2} \vec{r}_2$

15. If $\vec{F} = (x+y+1)\vec{i} + \vec{j} - (x+y)\vec{k}$, show that $\vec{F} \cdot \text{Curl } \vec{F} = 0$.

Or,

If \vec{a} is a constant vector, prove that $\nabla \cdot (\vec{a} \times \vec{r}) = 0$.

16. If \vec{r} be a position vector and \vec{a}, \vec{b} are constant vectors, prove that:

$$\text{div} \left[(\vec{r} \times \vec{a}) \times \vec{b} \right] = -2 \vec{b} \cdot \vec{a}$$

Contd. ...

PURBANCHAL UNIVERSITY

2014

B.E. (Civil/Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG102SH: Mathematics-II

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

All questions carry equal marks.

Answer ALL questions.

1. The plane $lx + my = 0$ is rotated about its line of intersection with the plane $z = 0$ through an angle α . Prove that the equation to the plane in its new position is $lx + my \pm \sqrt{l^2 + m^2} \tan \alpha = 0$.

2. Find the distance from the point $(3, 4, 5)$ to the point where the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ meets the plane $x + y + z = 2$.

Or,

Prove that the lines $\frac{x+1}{2} = \frac{y+1}{3} = \frac{z+1}{4}$ and $x+2y+3z-14 = 0 = 2x - 3y - 2z + 10$ are coplanar and that they meet at point $(1, 2, 3)$.

3. Find the shortest distance between the lines $\frac{x}{2} = \frac{y}{-3} = \frac{z}{1}$ and $\frac{x-2}{3} = \frac{1-y}{5} = \frac{z+2}{2}$. Find also the equations of shortest distance.

4. Obtain the equation of sphere which passes through three points $(1, 0, 0)$, $(0, 1, 0)$, $(0, 0, 1)$ and has its radius as small as possible.

Or,

Find the equation of the cone with vertex (α, β, γ) and the base $y^2 = 4ax, z = 0$.

Contd. ...

5. Find the eccentricity, directrix and identify the conic and sketch the graph of $r = \frac{12}{2+6\cos\theta}$. (2)

Or,

Find the parametric equations for a cycloid.

6. Find the area of surface generated by revolving the curve $r = 2+2\cos\theta$ about polar axis.

7. Test the convergence of series:

$$1 + \frac{2}{5}x + \frac{6}{9}x^2 + \frac{14}{17}x^3 + \dots + \frac{2^n - 2}{2^n + 1}x^{n-1} + \dots (x > 0).$$

Or,

Show that p-series $\sum_{n=1}^{\infty} \frac{1}{n^p} = \frac{1}{1^p} + \frac{1}{2^p} + \frac{1}{3^p} + \dots$ converges for $p > 1$ and diverges for $p \leq 1$.

8. Find the interval and radius of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{2^n (x-3)^n}{n+3}$$

9. If $\vec{r} = \vec{a}\cos\omega t + \vec{b}\sin\omega t$, show that $\vec{r} \times \frac{d\vec{r}}{dt} = \omega(\vec{a} \times \vec{b})$ and

$$\frac{d^2\vec{r}}{dt^2} = -\omega^2\vec{r} \text{ where } \vec{a} \text{ and } \vec{b} \text{ are constant vectors and } \omega \text{ is a constant.}$$

10. Prove that:

$$\text{Curl}(\vec{a} \times \vec{b}) = (\vec{b} \cdot \nabla)\vec{a} - (\vec{a} \cdot \nabla)\vec{b} + \vec{a} \text{ div } \vec{b} - \vec{b} \text{ div } \vec{a}$$

Or,

Find the angle between the surface $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point $(2, -1, 2)$.

Contd. ...

11. If $\vec{r} = (x, y, z)$ and \vec{a}, \vec{b} are constant vectors, prove (3)
- $$\nabla \cdot [(\vec{r} \times \vec{a}) \times \vec{b}] = -2\vec{a} \cdot \vec{b}$$

12. Solve: $\frac{dy}{dx} + \frac{3xy + y^2}{x^2 + xy} = 0$

Or,

$$\text{Solve } (2x+3y-5)dy + (3x+2y-5)dx = 0.$$

13. Solve: $\frac{dy}{dx} - 2y \tan x = y^2 \tan^2 x$

14. Solve $x^2 dy + xy dx + 2\sqrt{1-x^2} y^2 dx = 0$

Or,

$$\frac{d^2 y}{dx^2} - 2\frac{dy}{dx} + y = xe^x \sin x.$$

15. Solve $\frac{d^2 y}{dx^2} - 4\frac{dy}{dx} + 5y = 0$ given that $y = 1$ and $\frac{dy}{dx} = 0$ at $x = 0$.

16. Solve the following differential equation by power series method $y'' + 4y = 0$

Or,

$$\text{Prove that: } J_{-5/2}(x) = \sqrt{\frac{2}{\pi x}} \left(\frac{3}{2} \sin x + \frac{3-x^2}{x^2} \cos x \right)$$

PURBANCHAL UNIVERSITY

2013

B.E. (Civil/Computer/Electronics & Comm.)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG102SH: Mathematics-II

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

All questions carry equal marks.

Answer ALL questions.

1. Find the equation of the plane through $(-1, 1, -1)$ and $(6, 2, 1)$ normal to the plane $2x + y + z = 5$. ② 2399
2. Find the equation of the straight line through point $(1, 2, 3)$ and parallel to the line of intersection of the planes $x - 2y + z = 3$ and $4x + 4y - 5z = 2$.

Or,

Find the equation of a plane containing the line $\frac{x-1}{2} = \frac{-y-1}{1} = \frac{z-3}{4}$ and is perpendicular to the plane $x + 2y + z = 12$.

Find the magnitude and the equation of line of shortest distance between the lines $\frac{x-8}{3} = \frac{y+9}{-16} = \frac{z-10}{7}$ and

$$\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$$

4. Obtain the equation of sphere having its centre on the line $5y + 2z = 0 = 2x - 3y$ and passing through the two points $(0, -2, -4)$ and $(2, -1, -1)$. ② $7y + 16z = 22$

Or,

5. Find the equation of the cone with vertex (α, β, γ) and base

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, z = 0.$$

Contd. ...

(2)

5. Find eccentricity, identify the conic and also sketch the graph of

$$r = \frac{10}{3 - 2 \cos \theta}$$

Or,

Find the area of surface generated by revolving the curve $x = 3t^2$, $y = 2t^3$, $0 \leq t \leq 1$ about y-axis.

6. Find the area of the region that is bounded by the cardioid $r = 1 + \cos \theta$.

7. The necessary and sufficient condition for vector function of a scalar variable to have a constant direction is $\bar{a} \times \frac{d\bar{a}}{dt} = 0$.

Or,

If $\phi = x^3 + y^3 + z^3 - 3xyz$, find $\text{div}(\text{grad} \phi)$ and $\text{curl}(\text{grad} \phi)$.

8. If $\phi = x + y + z$; $\Psi = x^2 + y^2 + z^2$ and $p = xy + yz + zx$, show that $[\text{grad} \phi \text{ grad} \Psi \text{ grad} p] = 0$.

9. If $\bar{r} = (x, y, z)$ and \bar{a}, \bar{b} are constant vectors, prove that:

$$\nabla \cdot [(\bar{r} \times \bar{a}) \times \bar{b}] = -2\bar{a} \cdot \bar{b}$$

10. Test for convergence of the series:

$$\frac{x}{1} + \frac{1}{2} \frac{x^2}{3} + \frac{1.3}{2.4} \frac{x^3}{5} + \frac{1.3.5}{2.4.6} \frac{x^4}{7} + \dots$$

$$x + \frac{3}{5} x^2 + \frac{8}{10} x^3 + \frac{15}{17} x^4 + \dots + \frac{n^2 - 1}{n^2 + 1} x^n + \dots$$

11. Find the interval and radius of convergence of the series

$$\frac{1}{1.2} (x-2) + \frac{1}{2.3} (x-2)^2 + \frac{1}{3.4} (x-2)^3 + \dots + \frac{1}{n(n+1)} (x-2)^n + \dots$$

Contd. ...

12. Solve: $(xy^2 + x)dx + (yx^2 + y)dy = 0$ (3)

13. Solve: $\frac{dy}{dx} + \frac{2x}{1+x^2} y = \frac{1}{(1+x^2)}$

Or,

$$\text{Solve: } x \frac{dy}{dx} + y = x^3 y^6$$

14. Solve the differential equation (any ONE):

$$(a) (D^2 - 2D + 1)y = x^2 e^x$$

$$(b) (D^2 + 3D + 2)y = e^{2x} \sin x$$

15. Solve the initial value problem:

$$\frac{d^2 y}{dx^2} - 4 \frac{dy}{dx} + 3y = 10e^{-2x}, y(0) = 1, y'(0) = 3$$

16. Solve the following differential equation by power series method:

$$y'' + xy = 0$$

Or,

$$\text{Prove that: } xJ'_n(x) = -nJ_n(x) + xJ_{n-1}(x)$$

PURBANCHAL UNIVERSITY

2012

B.E. (Civil/Computer/Electronics & Comm.)/Second Semester/Chance
Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32
BEG102SH: Mathematics-II (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.



1. Find the equation of the plane through the point $(-1, 1, -1)$ and $(6, 2, 1)$ normal to the plane $2x + y + z = 5$.

2. Find the distance from the point $(3, 4, 5)$ to the point where the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ meets the plane $x+y+z=2$.

Or

3. Find the image of the point $P(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.

4. Show that the lines $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ and $x = \frac{y-7}{-3} = \frac{z+7}{2}$ are coplanar. Also, find the equation of the plane containing them.

5. Find the equation of a sphere of which the circle $x^2 + y^2 + z^2 + 10y - 4z - 8 = 0$, $x + y + z = 3$ is a great circle.

Or

Show that the equation to the cone whose vertex is (α, β, γ) and base $z^2 = 4ax, y = 0$ is $(\beta z - \gamma)^2 = 4a(\beta - \gamma)(\beta x - \alpha y)$.

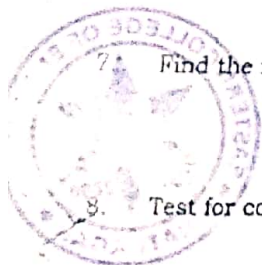
6. Find the area of surface generated by revolving the curve $r = 2 + 2\cos\theta$ about polar axis.

7. Derive the Parametric Equation of a cycloid.

Or

Find the eccentricity, identify the conic, find the directrix and sketch the graph $r = \frac{15}{1 + 2\sin\theta}$.

Contd. ...



(2)

7. Find the interval and radius of convergence of the series $\sum \frac{x^n}{\sqrt{n}}$.

Or

8. Test for convergence of the series $\frac{x}{1.2} + \frac{x^2}{3.4} + \frac{x^3}{5.6} + \dots$ where $x < 0$.

Or

Test the convergence of the series $\sum_{n=1}^{\infty} \frac{n}{1+n\sqrt{n+1}}$.

9. The necessary and sufficient condition for the vector function \vec{a} of a scalar variable t to have a constant direction is $\vec{a} \times \frac{d\vec{a}}{dt} = 0$.

10. Find the angle between the normal to the surface $xy = z^2$ at point $(1, 4, 2)$ and $(-3, -3, 3)$.

Or

11. If \vec{a} is a constant vector, prove that $\nabla \cdot \left(\frac{\vec{a} \times \vec{r}}{r^n} \right) = 0$.

12. If $\vec{r} = (x, y, z)$ and \vec{a}, \vec{b} are constant vectors, prove that $\text{grad}[\vec{r} \cdot \vec{a} \cdot \vec{b}] = \vec{a} \times \vec{b}$.

13. Solve: $(x^2 - y^2)dx + 2xy dy = 0$

14. Solve: $(1 + y^2) + (x - e^{\tan^{-1}y}) \frac{dy}{dx} = 0$

15. Solve: $xdy - ydx + a(x^2 + y^2)dx = 0$

Or

$\sin x dy - y \cos x dx + y^2 dx = 0$.

Contd. ...

(3)

15. Solve: $\frac{d^2y}{dt^2} + \mu y = 0 (\mu > 0)$, given that $y = a$ and $\frac{dy}{dt} = 0$

$t = \frac{\pi}{2\sqrt{\mu}}$

16. Solve the power series method: $y'' - y = 0$.

Or

Prove that: $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$.

PURBANCHAL UNIVERSITY

2018

B.E. (Computer/E. & C./ Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG104SH: Chemistry (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.

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

Answer FIVE questions, selecting at least TWO questions from Group A and ONE each from Group B and C.

Group A

- 1(a) Derive an expression to find schrodinger wave equation. What are the significance of Ψ and Ψ^2 in schrodinger wave equation. 8+2
- (b) What do you understand by dual character of electron? Derive de-Broglie equation. 2+4
- 2(a) What is buffer solution? Derive Henderson's equation for basic buffer. Calculate P^H of a mixture of 10ml of 0.1 M ammonium chloride solution and same volume of 0.2M ammonia solution (p^H for ammonia solution = 4.74) 2+2+4
- (b) How does galvanic cell generate electricity? Construct a cell with following cell reaction. Write its notation and calculate standard emf of the cell. 2+1+1+4
- $2Al + 3ZnSO_4 \longrightarrow Al_2(SO_4)_3 + Zn$ at $25^\circ C$.
- (1M) 1(M)
- Given, standard reduction potential of Al and Zn are -1.66V and 0.76V respectively.
- 3(a) Discuss the electrovalent bond with its characters. Draw the crystal structure of NaCl. 8
- (b) Explain "electron sea theory" of metallic bond. Explain any two properties of metals on the basis of electron sea theory". 8
4. Write short notes on any TWO: 8+8
- (a) Quantum number (b) Corrosion of metal.
- (c) Ostwald's dilution law.

Contd. ...

(2)

Group B

5. What are d-block elements? In what way are the electronic configurations of d-block elements different from those of s-block elements? How do the following properties vary in 3d series of transition elements? 2+4+2.5×4=16
- (a) Magnetic property
 - (b) Colour formation
 - (c) Variable oxidation state
 - (d) Covalent radii
- 6(a) What are the postulates of Werner's theory? Calculate the EAN of the central metal ions in the following complexes. 6+2
- (i) $[\text{Cu}(\text{NH}_3)_4]^{++}$
 - (ii) $[\text{Fe}(\text{CN})_6]^{4-}$
- (b) State the postulates of valence bond theory for the formation of coordination compounds. Explain why octahedral complexes of Ni^{2+} ion are outer octahedral complex. 6+2
7. Write short notes on any TWO: 8+8
- (a) Ligands and its classification
 - (b) Characteristics and properties of transition metal
 - (c) Applications of 3d transition elements.

Group C

- 8(a) Write the mechanism of unimolecular elimination reaction. How does it differ from bimolecular elimination reaction? 6+2
- (b) Why does haloalkane favour S_N reaction? Explain why there is only inversion product in $\text{S}_\text{N}2$ reaction and both inversion and retention products in $\text{S}_\text{N}1$ path. 2+3+3
- 9(a) Distinguish between enantiomers and diastereomers. Show all optical isomers of (i) 3-Bromo 2-butanol and (ii) Tartaric acid. Also show optically inactive meso form of tartaric acid. Explain why 3-Bromo 2-butanol does not exist in meso form. 2+4+1+3
- (b) Write down the synthetic uses of Grignard's reagent. 6
10. Write short notes on any TWO: 8+8
- (a) Rearrangement reaction
 - (b) TNT and TNG
 - (a) Addition polymer and condensed polymer



PURBANCHAL UNIVERSITY

2016

B.E. (Computer/E. & C./ Electrical)/Second Semester/*Final*

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG104SH: Chemistry (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.

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

Answer FIVE questions, selecting at least TWO questions from Group A and ONE from Group B and C.

Group A

- 1(a) What is electrode potential? How does it originate? Explain the process of determining the standard electrode potential of zinc. 6+2
- (b) Calculate the percentage ionization of 0.1M acetic acid in (a) water and (b) 0.2M sodium acetate. Also calculate the concentration of H⁺ ion and pH of such solutions. K_a of acetic acid is 1.8×10^{-5} . 8
- 2(a) What do you mean by metallic bond? Explain the electron gas model of metallic bonding. How does this model explain conductivity and malleability properties of metal? 2+8
- (b) Explain electrovalency with examples. Write the Characteristics of electrovalent compounds. 2+4
- 3(a) Derive time independent Schrodinger's wave equation. Write significances of Ψ and Ψ^2 : 10
- (b) Write short note on Pauli's exclusion principle. 6
4. Write short notes on any TWO: 8+8
- (a) Mechanism of buffer action
- (b) Nernst's equation
- (c) Aufbau Principle

Contd. ...

(2)

Group B

5. Mention the differences between inner orbital and outer orbital complexes. How does VBT explain the formation of $[\text{Co}(\text{NH}_3)_6]^{2+}$ $[\text{CoF}_6]^{4-}$. 6+10

6. Define d-block elements. Explain the following with suitable reasons; (a) Fe^{3+} is more paramagnetic than Fe^{2+} (b) TiO_2 is white but TiCl_3 is violet (c) Cu^+ salt are colorless but Cu^{2+} salts are colored. 4+12

7. Write short notes on any TWO: 8+8

(a) Werner's co-ordination theory.

(b) Ligands

(c) Diamagnetism and paramagnetism.

Group C

8. Define carbonium ion and carboanion. Why is carbonium ion formed at intermediate in $\text{S}_{\text{N}}1$ mechanism and what are the possible configurations of the products of $\text{S}_{\text{N}}1$ mechanism. 6+10

9(a) Explain optical isomerism and geometrical isomerism with example. 8

(b) State and explain Markonikov's addition reaction with suitable example. What do you mean by peroxide effect? 8

10. Write short notes on any TWO: 8+8

(a) Elimination reaction

(b) Properties of Grignard's Reagent

(c) Synthetic fiber

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PURBANCHAL UNIVERSITY

2014

B.E. (Computer/E. & C./ Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG104SH: Chemistry

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

The figures in the margin indicate full marks.

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

Answer FIVE questions, selecting at least TWO questions from Group A and ONE from Group B and C.

Group A

1. What do you mean by wave function? Derive the time independent Schrodinger wave equation for an electron in atom. What are the conditions for well accepted wave function? Write the significances of Ψ and Ψ^2 . 2+8+3+3
- 2(a) What do you mean by electrovalent bond? Illustrate the formation and electrovalent bond in NaCl. 2+3
- (b) Describe metallic bond on the basis of 'electronic gas theory'. Give short explanations of the properties of metal on the basis of metallic bond. 5+6
- 3(a) Differentiate between strong electrolyte and weak electrolyte. Show the relation between degree of ionization and dilution and weak electrolyte on the basis of Ostwald's dilution law. 2+3
- (b) What do you mean by butter solution? Construct Galvanic cell by using Cu and Ag electrodes. Calculate the emf of cell when $[Cu^{2+}] = 0.01M$ and $[Ag^+] = 0.001M$. $E^{\circ}_{Cu^{2+}/Cu} = +0.34V$ $E^{\circ}_{Ag^+/Ag} = 0.8V$. 1+10
4. Write Short notes on any TWO: 8+8
 - (a) Quantum numbers
 - (b) Corrosion of metals
 - (c) Aufbau principles

Contd. ...

PURBANCHAL UNIVERSITY

2015

B.E. (Computer/E. & C./ Electrical)/Second Semester/Final/Chances: Best

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG104SH: Chemistry

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

The figures in the margin indicate full marks.

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

Answer FIVE questions, selecting at least TWO questions from Group A and ONE from Group B and C.

Group A

- 1(a) Derive the schrodinger's time independent equation and write the significance of ψ and ψ^2 . 8+2
- (b) Write short note on Aufbau principle. 6
- 2(a) What is a buffer solution? Derive Henderson's equation to calculate the pH of a buffer solution. Find the pH of a buffer solution containing 0.2 mole per liter CH_3COONa and 0.15 mole per litre CH_3COOH . K_a for acetic acid is 1.8×10^{-5} . 2+4+4
- (b) Calculate the emf of the cell at 25°C. $Zn|Zn^{2+} (0.001M) || Ag^+ (0.1M)|Ag$.
Given,
 $E^{\circ}_{Ag^+/Ag} = +0.80V$ and $E^{\circ}_{Zn^{2+}/Zn} = -0.76V$.
- 3(a) Explain Electrovalent bond with suitable examples. What are the characteristics of Ionic compounds? 6+4
- (b) Explain metallic bond in terms of "Electron sea theory". 6
4. Write short notes on any TWO: 2x8=16
 - (a) Quantum numbers
 - (b) Ostwald's dilution law
 - (c) Corrosion of Metals and its preventions

Contd. ...

Group B

Write the postulate of the VBT and formation of octahedral complex $[\text{Co}(\text{NH}_3)_6]^{3+}$ $[\text{CoF}_6]^{3-}$ 8+4+4

What is the transition metal? Why is Zn, Cd and Hg not included in d-orbitals? Write following properties of transition metal. 2+2+6+6

(a) Formation of complex compound

(b) Colour formation

Write short notes any TWO:

(a) Werner's theory of co-ordination compound

(b) Classification of ligands

(c) Magnetic properties of Transition metal

Group C

What do you mean by addition and elimination reactions? Explain the mechanism of E_1 and E_2 reaction. 6+4+6

What are enantiomer and diastereomers? Explain the optical isomerism shown by tartaric acid and mention conditions for optical isomerism. 6+6+4

Write short notes any TWO: 2×8=16

(a) Markonikoffs rule and its mechanism

(b) Grignard's reagent

(c) Polymerization

(2)

Group B

5(a) Differentiate between simple salt and complex salt. Write main postulates of Werner's theory.

(b) Describe the formation octahedral and tetrahedral complex on the basis of valence bond theory.

6(a) What are transition metals? Write the general electronic configurations of transition metals.

(b) Describe the following properties of transition metal:

(i) Variable oxidation states

(ii) Magnetic properties

(iii) Formation of colored compounds

7. Write short notes on any TWO:

(a) Postulates of V.B.T.

(b) Drawbacks of Werner's theory

(c) Complex formation properties of transition metals

Group C

8. Illustrate substitution reaction. Describe SN^1 and SN^2 reaction on the basis of mechanism and Kinetics.

9(a) How optical isomerism differs from geometrical isomers? Explain.

(b) What is Grignard reagent? Write the important synthetic applications of Grignard reagent.

10. Write short notes on any TWO:

(a) Polymers and Polymerization reactions

(b) Racemic modification

(c) High and low explosives

Ans

PURBANCHAL UNIVERSITY

2013

B.E. (Computer/Electronics & Comm.)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG104SH: Chemistry

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

The figures in the margin indicate full marks.

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

Answer FIVE questions, selecting at least TWO questions from Group A and ONE from Group B and C.

Group A

- 1[a] Derive the Schrodinger's time independent equation in three dimensional forms and write the significances of ψ and ψ^2 and ψ^2 . 8+2
- [b] Write short notes on the stability of noble gases. 6
- 2[a] What do you mean by standard and non-standard electrode potential? Describe the method to determine standard electrode potential of copper when it is constructed as anode. 2+2+6
- (b) A cell is formed by dipping Zn-rod in 0.01 M Zn^{2+} solution and Ni-rod in 0.5M Ni^{2+} solution. Write the cell reaction, cell notation and calculate the emf of the cell. $E^0_{Zn^{2+}/Zn} = -0.76V$ and $E^0_{Ni^{2+}/Ni} = -0.25V$. 6
- 3(a) What do you mean by electrovalent bond? Explain with examples. What are the general characteristics of electrovalent compounds? 8+4
- (b) Define the terms lattice points and crystal lattice. 4
4. Write Short notes on any TWO: 4×4=16
- (a) Azimuthal and magnetic quantum numbers.
- (b) Normal Hydrogen Electrode
- (c) Acid buffer solution

Contd. ...

(2)

Group B

5. Differentiate between inner orbital and outer orbital octahedral complexes? How would you use VBT to explain the formation of inner and outer orbital complexes? Give one example for each. 4+2×6
6. What are transition elements? Why are they called so? Explain the followings with suitable reasons; 2+2+3×4
- (a) Mn(II) ion shows maximum magnetic character among the bivalent ions of first transition series.
- (b) Cu (I) is diamagnetic while Cu (II) is paramagnetic.
- (c) Simple and complex compounds of transition metals are generally colored.
7. Write short notes on any TWO: 2×8×16
- (a) EAN rule and its applications
- (b) Werner's co-ordination theory
- (c) application of co-ordination compounds

Group C

8. What do you mean by rearrangement and elimination reaction? Explain the mechanism of E_1 and E_2 reaction. 6+4+6
9. What are enantiomers and diastereomers? Explain the conditions necessary for showing optical Isomerism. Discuss the Isomerism shown by lactic acid. 6+6+4
10. Write Short notes on any TWO: 2×8=16
- (a) Explosives
- (b) Cis-trans Isomerism
- (c) Properties of Grignard reagent

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13

PURBANCHAL UNIVERSITY

2018

B. E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG123EL: Electrical Engineering (New Course)

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

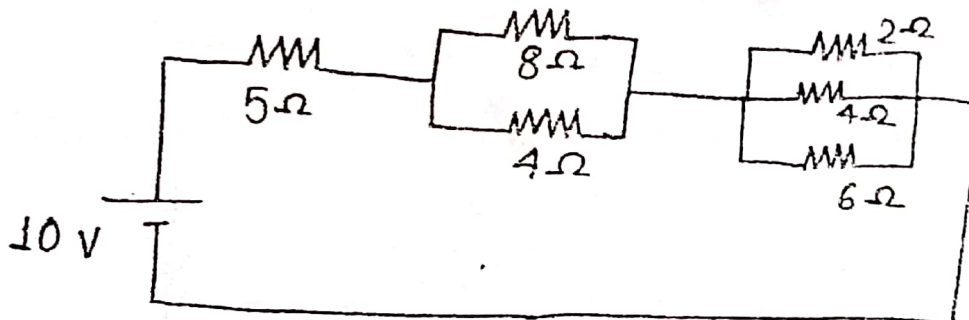
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

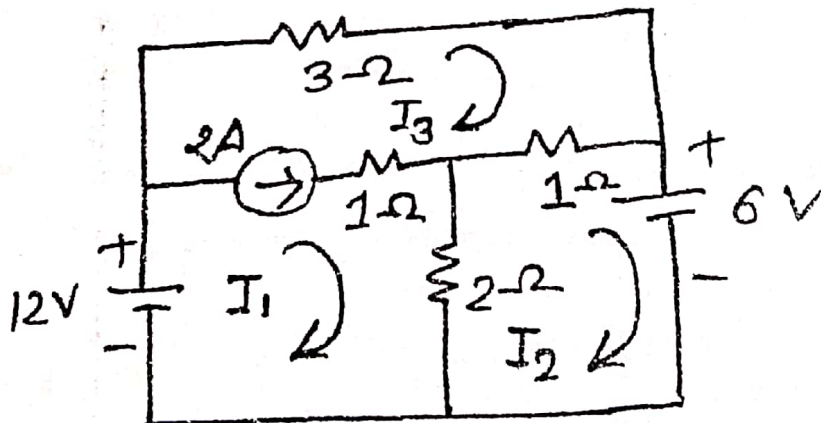
5×16=80

1(a) Explain ideal and practical voltage source with VI characteristics. 4

(b) For the network shown below, determine current in each resistances: 5

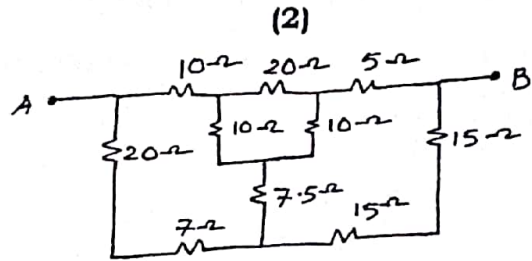


(c) Using mesh analysis determine current in 2Ω resistance. 7

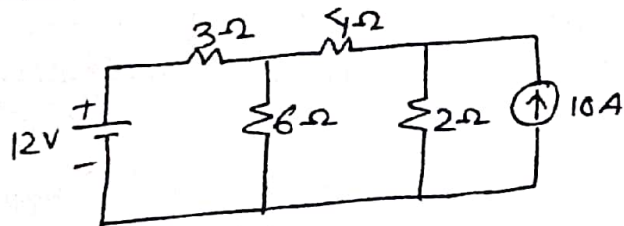


2(a) Using delta-star transformation, find the resistance between terminals A - B in the circuit of given figure. 6

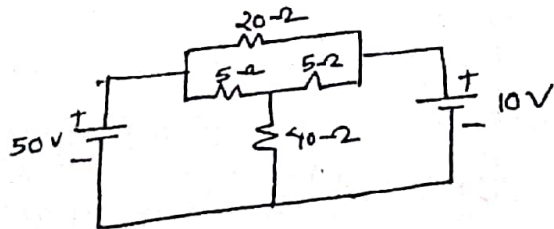
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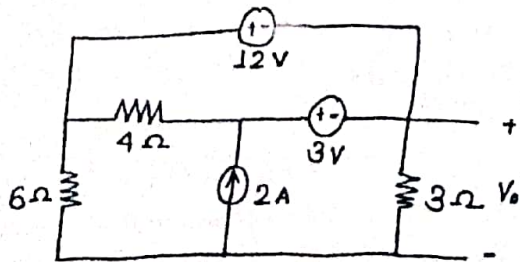
- (b) Calculate the current flowing through 4Ω resistor using Thevenin's theorem. Verify the result obtained using Norton's theorem. 5+5



- 3(a) Find the current through 40Ω resistor using superposition theorem. 6



- (b) Find V_0 in the given network using nodal analysis technique. 6

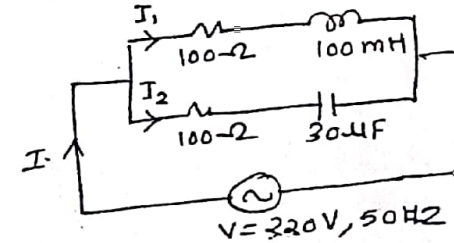


- State and explain reciprocity theorem. 4

(3)

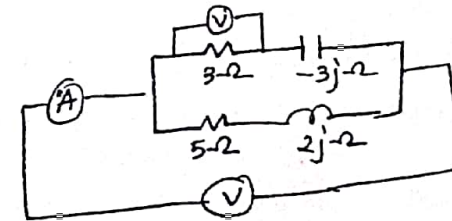
- 4(a) Prove that the average power dissipated by a pure inductor when excited by alternating voltage is zero.

- (b) For the circuit shown below find:
 (i) Magnitude and phase of I_1 and I_2 .
 (ii) Active and reactive power of path-1
 (iii) Active and reactive power of path-2
 (iv) Magnitude and phase of total current I
 (v) Draw the phasor diagrams showing V , I , I_1 and I_2 .



- 5(a) State Faraday's law of electromagnetic induction. Explain in brief, how alternating emf is generated. 2-4

- (b) Find the reading of ammeter and voltmeter when the voltmeter across 3Ω resistor in the circuit reads 45 V.



- (c) Each phase of a star connected load consists of impedance $(6+j8)\Omega$. Calculate the line current, phase current and three phase active power when connected to 400V, 50Hz, 3 phase supply. 4x4=16

6. Write short notes on any FOUR:

- Measurement of power in three phase system
- Power factor correction
- Kirchhoff's voltage law
- Temperature coefficient of resistance
- Resonance in parallel circuit

PURBANCHAL UNIVERSITY

2017

B. E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG123EL: Electrical Engineering (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 Resistance, Inductance and Capacitance. 4
- (b) Derive the relation to transform delta connected resistances into equivalent star connected resistance 6
- (c) Find the equivalent resistance between terminals 'a' and 'b'. 6

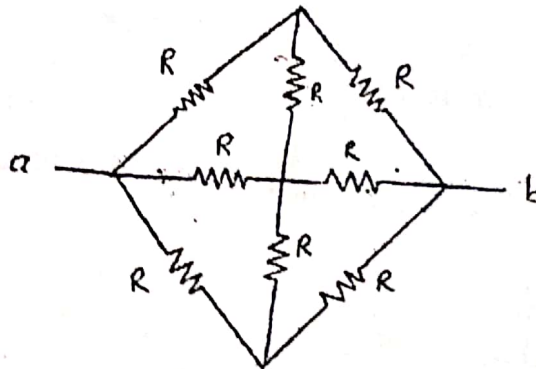


Fig. 1 (c)

- 2(a) Use Nodal analysis to determine the current in the 4Ω resistor in the circuit below in Fig. 2 (a). 6

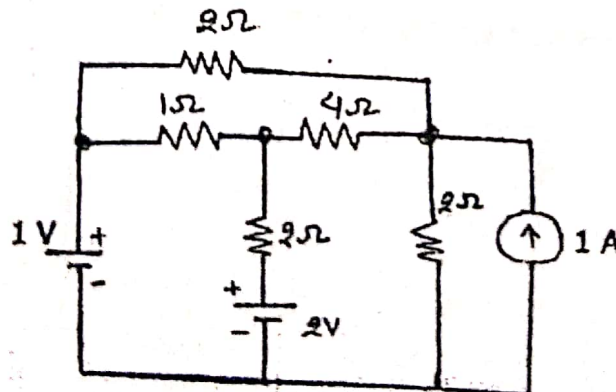


Fig. 2 (a)

Contd. ...

- (2)
- (b) Using Thevenin's theorem, calculate the current flowing through 4Ω resistor in Fig. 2(b). 6

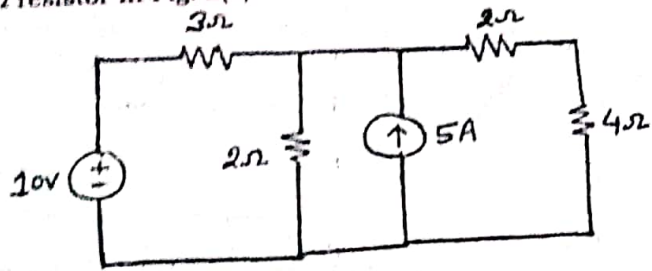


Fig. 2(b)

- (c) State and explain Kirchhoff's voltage law. 4
- 3(a) Find the value of 'R' in the network necessary to obtain maximum power in it. Also find the maximum power in R. 6

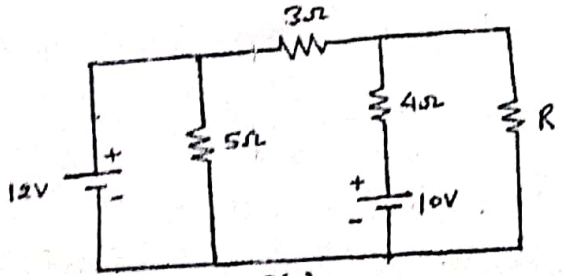


Fig. 3(a)

- (b) Find the current through 5Ω resistor using mesh analysis. 6

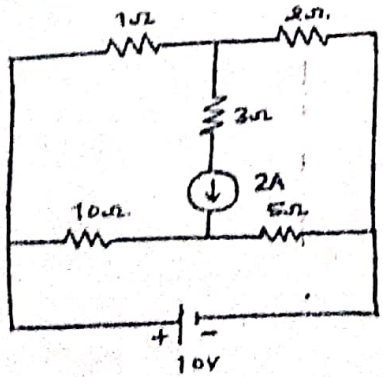


Fig. 3(b)

(3)

- (c) State and Explain Norton's theorem with an appropriate example. 2-2
- 4(a) A coil of inductance 100mH and resistance 100Ω is connected in parallel with capacitor of $200\mu\text{F}$ which is in series resistor of 100Ω . If the arrangement is connected to 220V , 50Hz . Calculate:
- Magnitude and phase of each branch current.
 - Active and reactive power of each branch.
 - Magnitude and phase of total current.
 - Draw the phase diagrams showing voltage, branch current and total current.
- (b) Explain parallel resonance with proper circuits and necessary diagrams. 8
- 5(a) An emf given by $v=100 \sin \pi t$ is impressed across a circuit consists of resistance of 40Ω in series with $100\mu\text{F}$ capacitor and 0.25H inductor. Determine:
- RMS value of current.
 - Power consumed
 - Power factor
 - Active, reactive and apparent power
- (b) A 480V , 3ϕ , 50Hz supply is provided to a balanced star connected load having resistance of 10Ω , inductance of 1mH and capacitance of $1\mu\text{F}$. Determine:
- Line current and phase current
 - Total power consumed
 - If the same load is connected in delta, what would be the total reactive power?
6. Write short notes on any FOUR: 4x4=
- Generation of three phase voltage
 - Temperature coefficient of resistance
 - Dependent and independent sources.
 - Power factor correction
 - Advantages of AC

(4)

(c) Two impedances $Z_1=10+j12$ and $Z_2=6-j8$ ohm are connected in parallel across an ac voltage. If the total current supplied is 15A, find,

- (i) Power factor of each branch 8
 - (ii) Power factor of circuit
 - (iii) Active, Reactive and Apparent Power of each branch.
- Also draw phasor diagram.

5(a) Prove that no current flows through neutral wire in balanced 3 ϕ star connected load with the aid of suitable figure and mathematical expression. 6

(b) The power input to a 3 ϕ induction motor is read by two wattmeters. The readings are 1000W and 350W. Calculate the power factor of motor. 3

(c) A balanced 3 ϕ system supplies an unbalanced delta connected load made up of two resistors of 100 Ω and 200 Ω and a coil having an inductance of 0.3H. The line voltage is 100V and supply frequency is 50Hz. Calculate 7

- (i) 3 ϕ active power
- (ii) 3 ϕ reactive power
- (iii) 3 ϕ apparent power

PUREANCHAL UNIVERSITY

2018

B. E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 20 / Pass Marks: 10

BEG123EL: Electrical Engineering (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.

3x16=48

1(a) State and explain ohm's law with necessary diagram.

(b) Derive a formula to express branch currents in terms of total current and conductance present in the circuit. Assume that there are three branches having resistances R_1, R_2, R_3 . 5

(c) Find current drawn from the source voltage of 100V in the figure 1. (All resistances are in ohm) 3

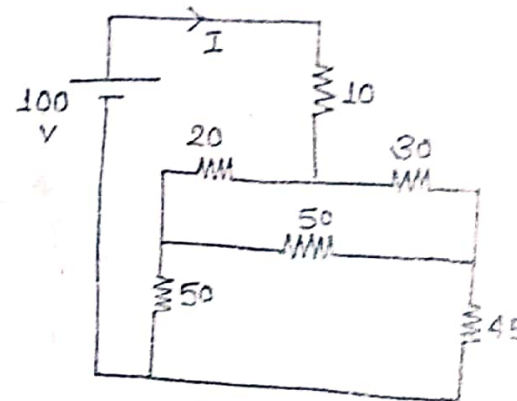
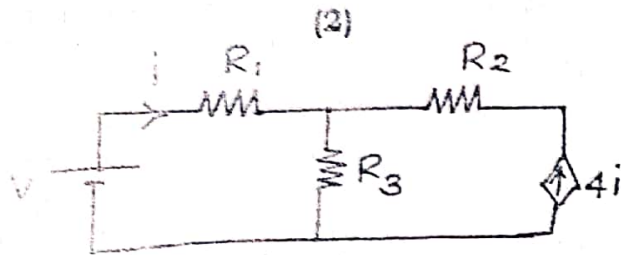
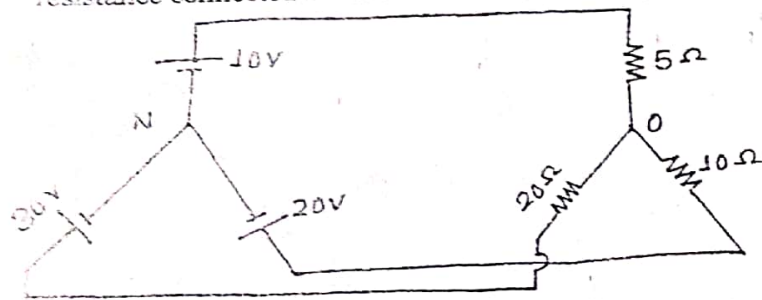


Fig. 1

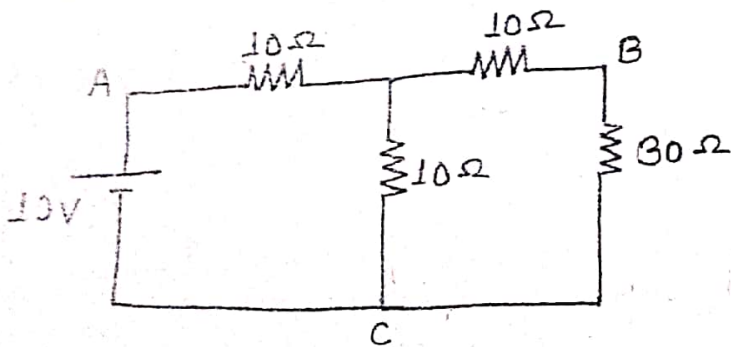
2(a) Can Reciprocity theorem be used in the following circuit? Justify your answer. (Refer fig. 2a). 3



b) Using Norton's theorem, find current which would flow in 25Ω resistance connected between N and O (Refer figure 2b). 7

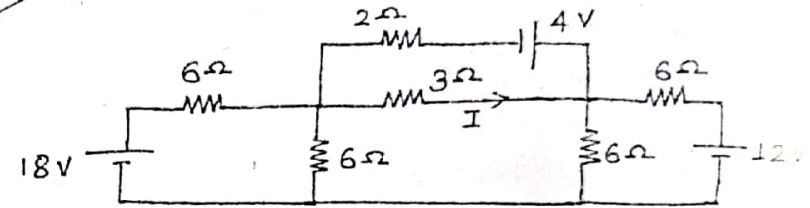


c) In the circuit shown in fig. 2(c) transform star ABC to delta and apply Thevenin's theorem to find voltage across 30Ω resistance. 1+5



(3)

- 3(a) State and prove maximum power transfer theorem.
 (b) Find I in the circuit using nodal analysis (Refer fig. 3(a))



- (c) Explain about super mesh and super node with suitable circuit diagram.
- 4(a) Define RMS and average value of alternating current.
 (b) Determine the form factor and peak amplitude factor of a half wave rectified sine wave.
 (c) Calculate frequency, peak value RMS value and average value of a voltage expressed as $V=15 \sin 100\pi t$. Find the expression for current flowing when this voltage is applied across:
 (i) 3Ω resistance
 (ii) 2mH inductance
 (iii) $140\mu\text{F}$ capacitance
- 5(a) A $5\mu\text{F}$ capacitor is connected in series with a coil having inductance of 58mH . Calculate the frequency at resonance. Also calculate the resistance of the coil if a 60V source voltage operating at resonant frequency causes current of 15mA . What is Q factor of coil?
 (b) Draw the nature of power triangle for series RL circuit and series RC circuit.

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

- 6(a) An impedance $Z_1 = (8 - j5)\Omega$ is in parallel with an impedance $Z_2 = 10\angle 30^\circ\Omega$. If 100V is applied on parallel combination, find:
- 2+1+2+1+2
- (i) branch current
 - (ii) power factor of each branch
 - (iii) Resultant current
 - (iv) Power factor of overall circuit
 - (v) Equivalent impedance, reactance and resistance
- (b) A star connected three phase load has a resistance of 8Ω and an inductive reactance of 6Ω in each phase. It is fed from a 400V, 3-phase balanced supply. Determine line current, power factor, active and reactive powers. If power measurement is made using two-wattmeter method, what will be the readings of both wattmeters? Also draw phasor diagram showing phase and line voltages and currents.
- 2+1+1+1+1+2

- 1(a) Define temperature coefficient of resistance. A coil has a resistance of 3.146Ω at 40°C and 3.767Ω at 100°C . Find the resistance at 0°C and temperature coefficient of resistance at 40°C .
- 1+2+2 = 5
- (b) Determine the voltage appearing across terminal BC if a dc voltage of 100V is applied across terminal AB in fig 1(b).
- 6

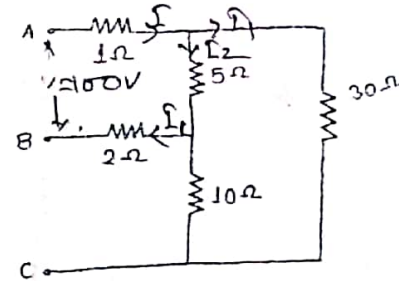
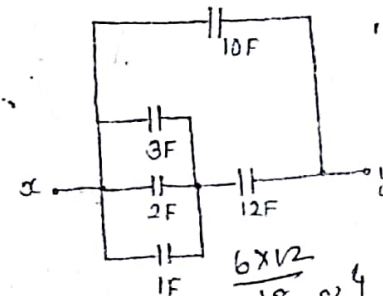


Fig. 1(b)

- (c) Find the equivalent capacitance of the circuit across x-y shown in figure 1(c).
- 5



$$\frac{6 \times 12}{18} = 4$$

$$\frac{22}{22} = 1$$

$$= 2$$

Fig 1(c)

Contd. ...

- (a) Find power dissipated in 100Ω resistance and voltage rating of the dependent source in figure 2(a). 2+2

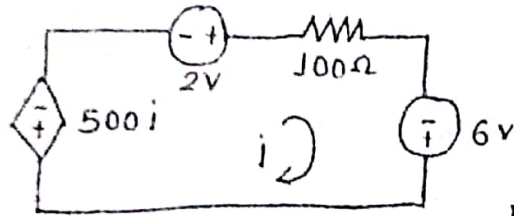


Fig. 2(a)

- (b) If the power loss in 1Ω resistance of figure 2(b) is 25W. Using nodal analysis, determine the value of K in the dependent source. 6

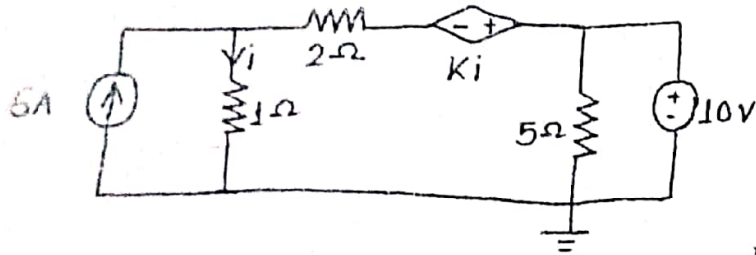


Fig. 2(b)

- (c) State and prove maximum power transfer theorem. 6
- 3(a) State superposition theorem. Determine power loss in 6Ω resistance of figure 3(a). Using superposition theorem. 1+5

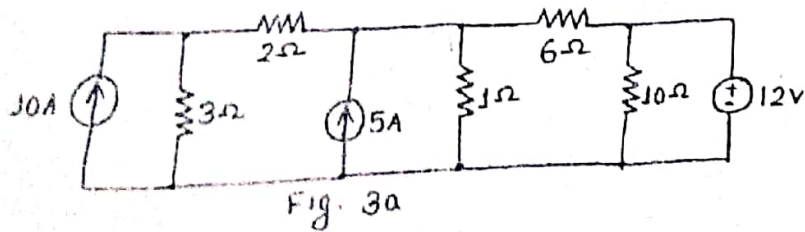


Fig. 3a

(3)

- (b) Use Thevenin's theorem to find current flowing in branch BC figure 3(b). Verify the result obtaining using Norton's theorem. 5

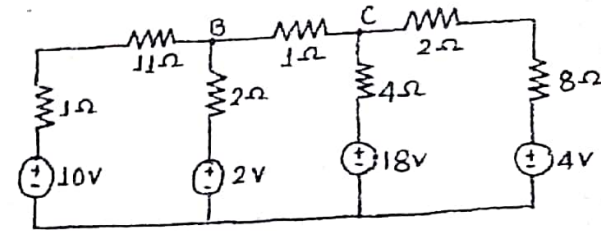


Fig. 3(b)

- 4(a) Define form factor of ac and derive the expression for average value of a.c.
- (b) A resistance of 10Ω is connected in series with a coil resistance 2Ω and inductance L H. If current drawn by the combination is 10A when the combination is energized by 200V 50Hz ac supply, determine inductance of coil, power factor of the coil and voltage across coil.
- (c) With the aid of suitable mathematical expression, prove that current in an inductance lags voltage by one right angle.
- 5(a) A 20Ω resistor is connected in series with an inductor and capacitor, across a variable frequency 25V supply. When frequency is 300Hz, the current in the circuit is maximum whose value is 0.5A. At the same instant p.d. across capacitor is 150V. Calculate resistance and inductance of inductor. Also calculate bandwidth Q-factor and half power frequencies at resonance. 2+2+1+1
- (b) The current taken from a 115V, 60Hz supply to a circuit is measured as 20A with a lagging power factor of 0.75. Calculate apparent power, true power and reactive power. Also determine the value of capacitance and its VAR rating that must be connected in parallel with the load to correct the power factor to unity. 3

Contd. ...

Contd. ...

(4)

(b) Two circuits, the impedance of which are given by $Z_1 = 10 + j15$ and $Z_2 = 6 - j8$ Ohms are connected in parallel. If the total current supplied is 15A, calculate active power, reactive power and apparent power of each branch and combination. Also draw vector diagram. 8

6(a) A star connected alternator supplies a delta connected load. The impedance of the load branch is $(8 + j6) \Omega$ /phase. The line voltage is 230V. Find current in the load branch, power consumed by load and reactive power of the load. 6

(b) Write short notes on: 5+5
(i) Power measurement in 3 ϕ ac circuit using 2 watt/meter methods.

(ii) Faraday's law of electromagnetic inductor

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PURBANCHAL UNIVERSITY

2013

B. E. (Computer/Electronics & Comm.)/Second Semester/Back

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

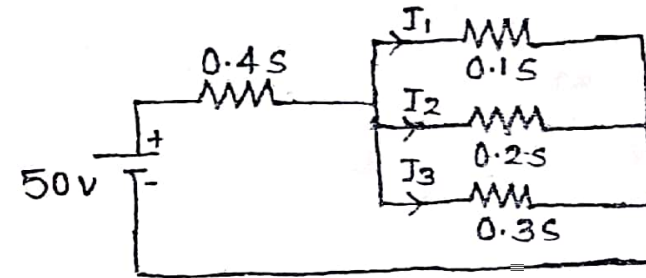
BEG123EL: Electrical Engineering-I

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

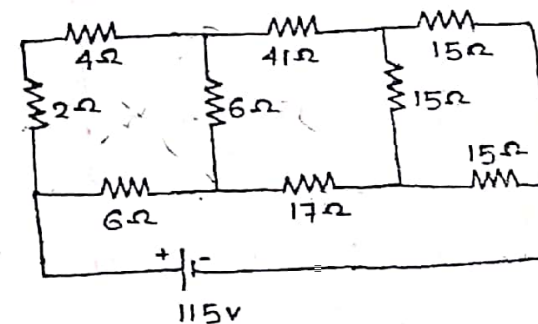
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- 1(a) State Ohm's law. Mention its limitations. 5
(b) Calculate the value of different currents for the circuit shown. What is total circuit resistance? 3+1

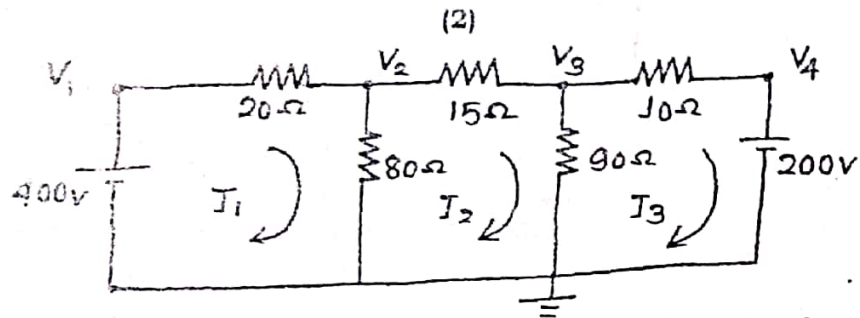


- (c) Find the current in 17 Ω resistor in the network using star/delta conversion. 7



- 2(a) By applying nodal method of network analysis, find current in 15 Ω resistor. Verify the result obtained using mesh analysis. 6+6

Contd. ...



- (b) State and explain reciprocity theorem with the help of an example. 4
- 3(a) Use Thevenin's theorem to calculate p.d. across terminal A and B. 5

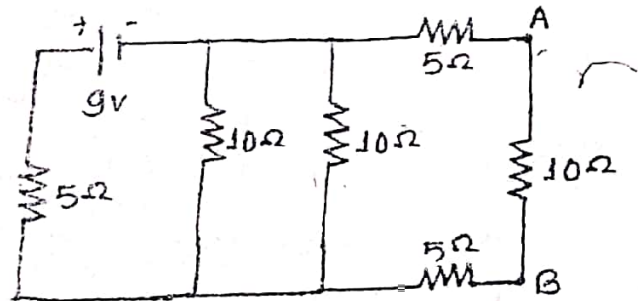


Fig. 3a

- (b) Calculate the current in 6Ω resistance using Norton's theorem. 6

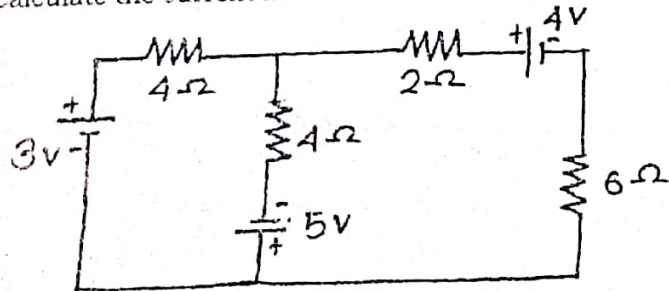


Fig. 3b

- (c) Calculate the value of R_L which will draw maximum power from the circuit. Also find the value of this maximum power. 5

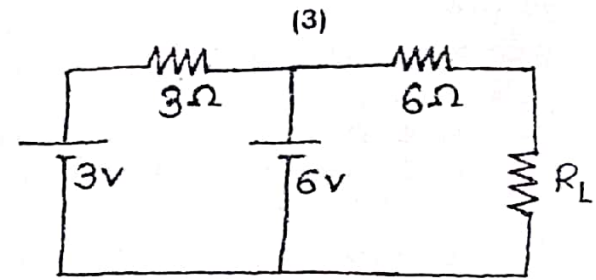


Fig. 3c

- 4(a) Derive an expression that gives impedance of series RC circuit
- (b) A 60Hz, voltage of 230V effective value is impressed on inductance of 0.265H. Write the time equation for voltage and the resulting current. Let the zero axis of voltage wave be at $t=0$. Show the voltage and current on a phasor diagram. Also maximum energy stored in inductance.
- (c) Find the form factor of the waveform.

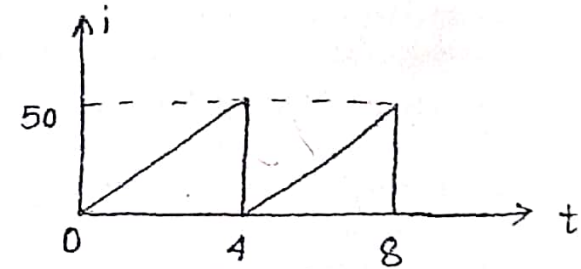


Fig. 4c

- 5(a) A circuit consists of a resistance of 12Ω, capacitance of 50μF and an inductance of 0.08H in series. A supply of 240V, 50Hz is applied to the circuit. Calculate:
- current in the coil
 - p.d. across each element
 - frequency at which p.f. is unity.
 - Volt-ampere at resonance

PURBA JHAR UNIVERSITY

2012

B. E. (Computer/Electronics & Comm.)/Second Semester/Chance

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG123EL: Electrical Engineering-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.

Answer FIVE questions.

- 1(a) A current of 78A is divided into three branches. The lengths of the wire in the three branches are in the ratio of 8, 12, and 16. The wires are of same material and cross sectional area. Calculate current in each branch. 4
- (b) A circuit consisting of three resistances 12Ω , 18Ω and 36Ω respectively joined in parallel is connected in series with a fourth resistance. The whole circuit is supplied at 60V and is found that power dissipated in 12Ω resistance is 36w. Find the fourth resistance and total power dissipation in the circuit. 6
- (c) Find the equivalent resistance as seen terminal AB and terminal CD. 7

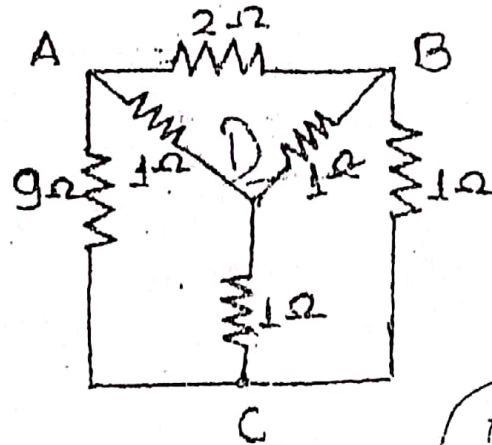


Fig. 1(c)

- 2(a) State and explain superposition theorem mention its limitations. 4+2
- (b) Use node voltage method to solve the Mesh currents in the network. 7

Contd. ...

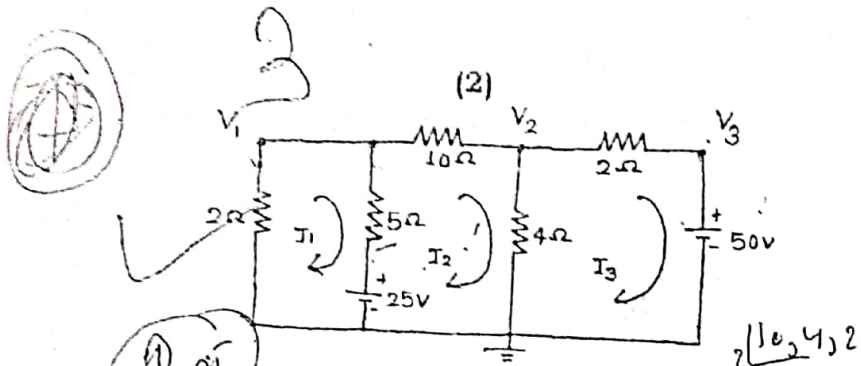


Fig. 2(b)

(c) State KVL. Explain with an example.

3(a) Find voltage 'V' using Norton's theorem.

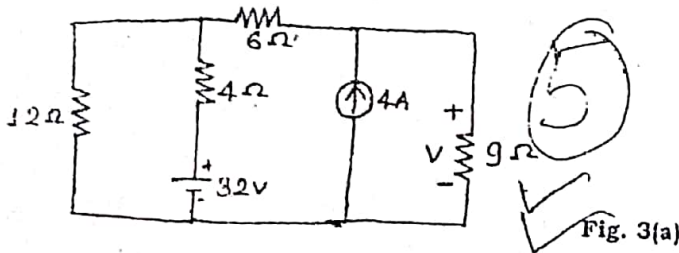


Fig. 3(a)

(b) Find the resistance seen by 30V source in the circuit.

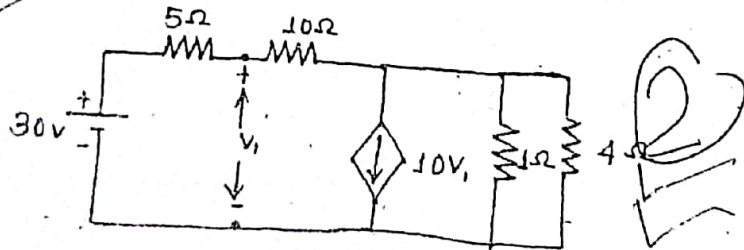
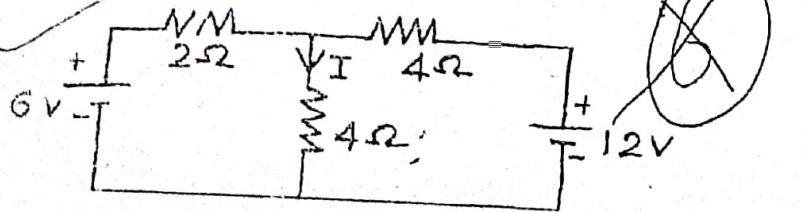


Fig. 3(b)

(c) Find current 'I' using Thevenin's theorem.



(3)

4(a) State Faraday's law of electromagnetic induction. Write expressions for average value and rms value of a sinusoidal varying ac voltage.

(b) An alternating current is represented by $i = 400 \sin(157t)$

Determine peak value, average value, rms value, frequency, period, form factor, peak factor and phase angle of the current represented.

5(a) A coil of resistance 10Ω and inductance $0.1H$ is connected in series with a capacitor of $150\mu F$ across $200V, 50Hz$ supply. Determine impedance, circuit current, active and reactive powers.

(b) A series combination of R and C is in parallel with 20Ω resistor across $50Hz$ source resulting in a total current of $7A$. If current through 20Ω resistor is $5A$ and in RC branch is $3A$ determine R and X_c .

(c) Differentiate between series resonant circuit and parallel resonant circuit.

6(a) A star connected three phase load consists of three series impedances. When load is connected to a three phase $400V, 50Hz$ supply, it takes $30A$ current at a p.f. of 0.8 (lag). Calculate

- Total power taken by load
- Resistance and reactance of load
- Reading of each wattmeter if power is measured by two wattmeter method

(b) Write short notes on:

- Voltages, currents and power in delta connection
- Power factor correction

PURBANCHAL UNIVERSITY

2018

B.E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG158CI: Applied Mechanics (New Course)

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

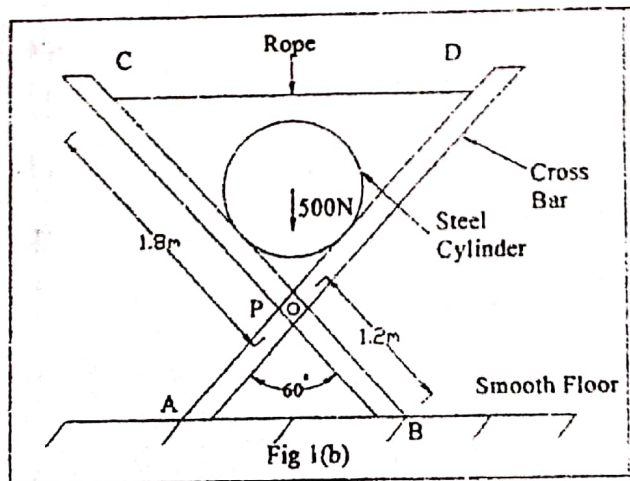
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions selecting at least TWO from each GROUP.

Group-A

1(a) Differentiate Rigid bodies and deformed bodies. What is particle? Explain in brief Force and Moment. 2+1+3

(b) A steel cylinder 1m in diameter and weighing 500 N is placed between two cross arms which make an angle of 60° with each other and are pinned at P as shown in fig 1(b). A rope attached to the arms near their upper ends prevents them from slipping. Assuming the floor to be smooth, determine the tension in the rope. Neglect the weight of the arms. 4+6

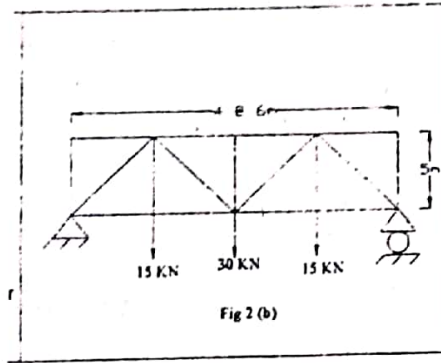


2(a) What are the equations of equilibrium in 2D and 3D? Explain in brief two and three force principle with regard to equilibrium. 1+1+1+1

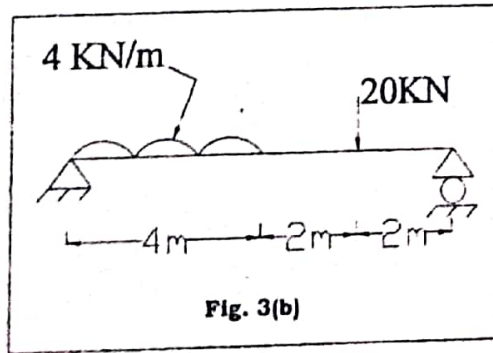
(b) Analyze the truss given in fig 2(b) using method of joint. 12

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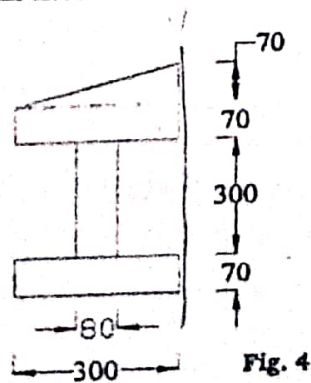
(2)



- 3(a) Explain with neat sketches how a force can be resolved into force and a couple. 4
- (b) Draw Shear force diagram, bending moment diagram of the following beam. 12



4. Find the moment of inertia of the composite section as shown in figure about centroidal axes. All dimensions are in mm. 16



(3)

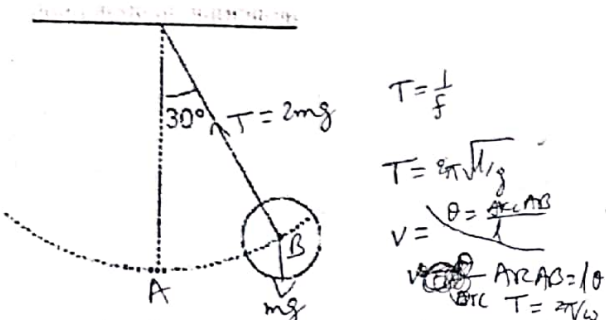
Group-B

- 5(a) Explain general plane motion with neat sketches.
- (b) A stone is dropped from the top of a tower 40m height. At the same instant, another stone is thrown upward from the foot of the tower with an initial velocity of 20 m/s. At what distance from the top and after how much time the two stones cross each other. Also calculate the relative velocity with which the stones cross.
- 6(a) Derive tangential and normal components of velocity and acceleration of particle moving along a curved path.
- (b) The acceleration of particle moving along a straight line is defined by $a=8-x$. The particle starts from rest at $t=0$ and origin $x=0$. Determine
- (a) Velocity of the particle when $x=10m$.
- (b) The position of the particle when velocity becomes zero.
- (c) Velocity of a particle when acceleration becomes zero.

(4)

5(a) What do you mean by general plane motion of the rigid body? Illustrate with example. 6

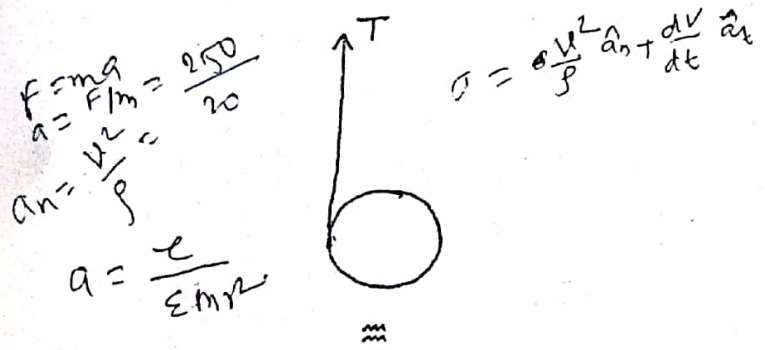
(b) The bob of a 6m pendulum describes an arc of circle in a vertical plane. If the tension in the cord is 2 times the weight of the bob for the position shown, find the velocity and acceleration of the bob in that position. 10



7(a) Write the expression for kinetic energy in translation, rotation and plane motion of a rigid body. 10

(b) A chord is wrapped around a homogeneous disk of radius 0.5 m and mass 20kg. If the chord is pulled upward with a force T of magnitude 250N, determine:

- (i) The acceleration of the centre of disk. 5
- (ii) The angular acceleration of the disk. 5



PURBANCHAL UNIVERSITY

2016

B.E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80/Pass Marks: 32

BEG158CI: Applied Mechanics (New Course)

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

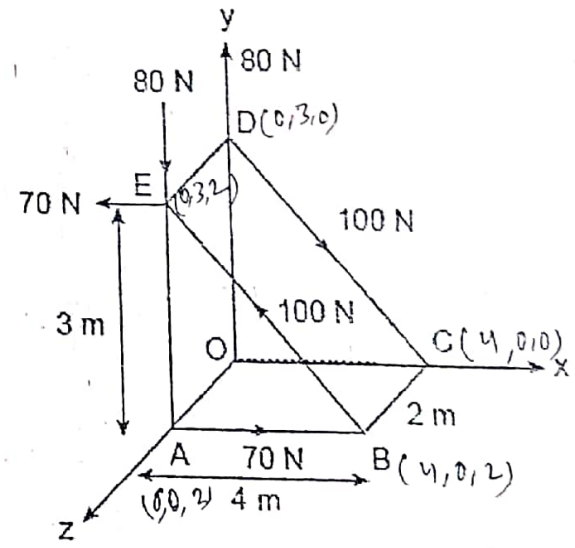
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions selecting at least TWO from each GROUP.

Group-A

1(a) Define Particle and rigid body. What do you mean by Static equilibrium condition of a body? Write the equilibrium equation in 2D and 3D. 6

(b) Define couple. Prove that couple is a free vector. Three pairs of couples are acted on the triangular block as shown in figure below. Determine the single resultant couple. 4+6



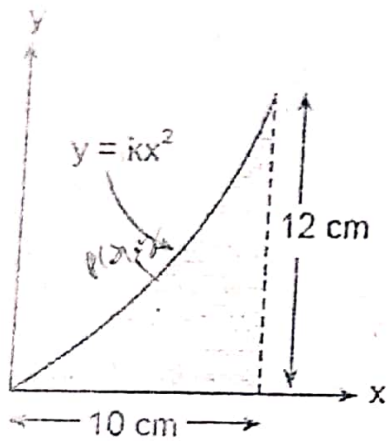
2(a) State and prove parallel axis theorem for moment of inertia. 6

Contd. ...

(2)

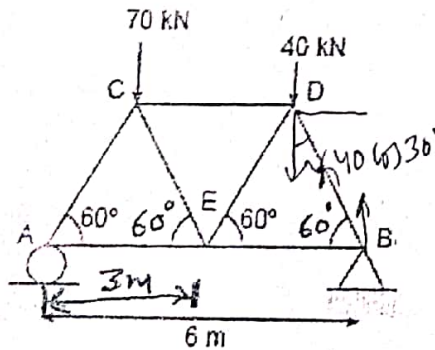
(b) Locate the centroid of the given curve:

10



3(a) A uniform ladder of weight 250 N and length 5 m is placed against a vertical wall in a position where its inclination to horizontal is 60° . A man weighing 800 N climbs the ladder. If the coefficient of friction for all surfaces = 0.2; at what position along a ladder will he induce slippage. 2+4

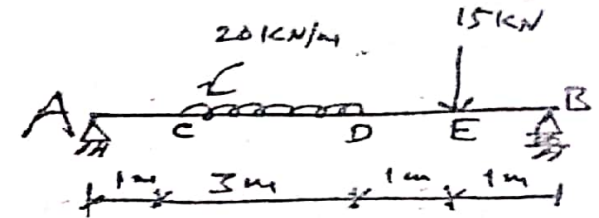
(b) Determine the member forces in each members of the given truss. 10



4(a) Derive an expression for the total pressure on an inclined immersed surface. 6

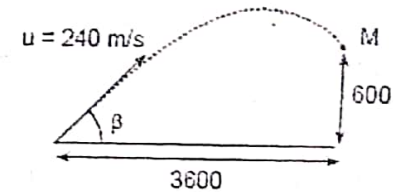
(3)

(b) Draw SFD and BMD for the beam shown.

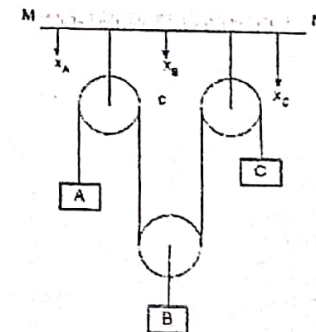


Group-B

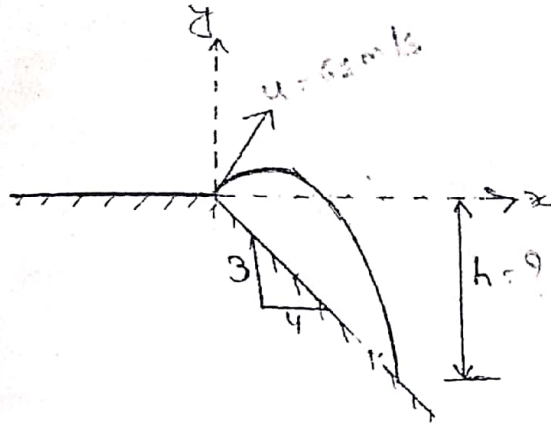
5(a) A projectile is fired with an initial velocity of 240 m/s at a target M located 600 m above a gun G and at a horizontal distance 3600 m. Neglecting air resistance, determine the value of angle β .



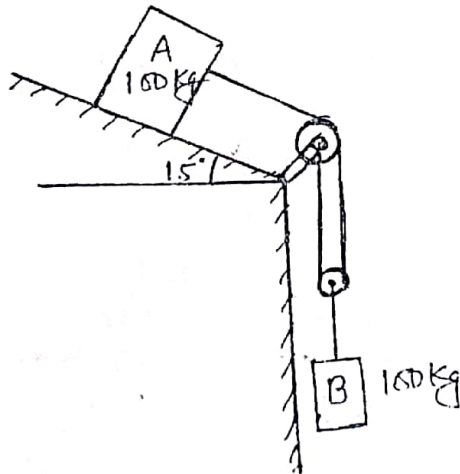
(b) For a pulley system as shown in figure, calculate the velocity and acceleration of the block C. If the velocity and acceleration of the blocks A and B are 4 m/s (\downarrow), 2 m/s² (\uparrow), 6 m/s (\uparrow) and m/s² (\uparrow) respectively.



- (b) A particle is projected at an angle of 30° with an initial velocity of 61m/sec as shown in fig. Find the sloping distance covered by the projectile. (4)
10



- (a) Prove that when a particles moving under a central force angular momentum is conserved. 6
- (b) Two block shown in fig. start from rest the pulleys are frictionless and having no mass. The kinetic friction between the block 'A' and the inclined plane is 0.4 . Determine the acceleration of each block and tension in each cord. 10



Contd. ...

PURBANCHAL UNIVERSITY

2015

B.E. (Computer/E. & C./Electrical)/Second Semester/Final/Chance/Back
Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32

BEG158CI: Applied Mechanics

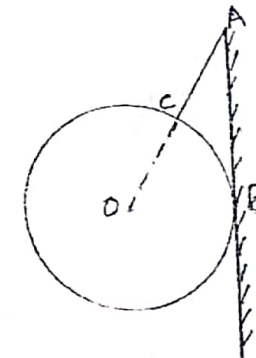
Candidates are required to give their answers in their own words as far as practicable.

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

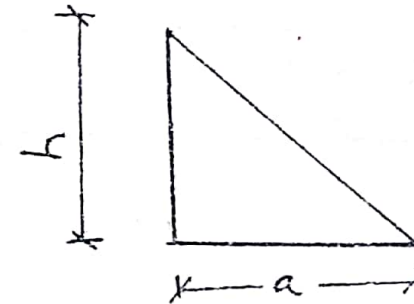
Answer FIVE questions selecting at least TWO from each GROUP.

Group-A

- 1(a) Explain free body diagram with an example and also explain dot product and cross product of vector. 4+2+2
- (b) A circular roller weighting 500N having a radius of 200mm hangs by a string AC 200mm long as shown in fig. Find the tension in the string and the reaction of the wall. 10



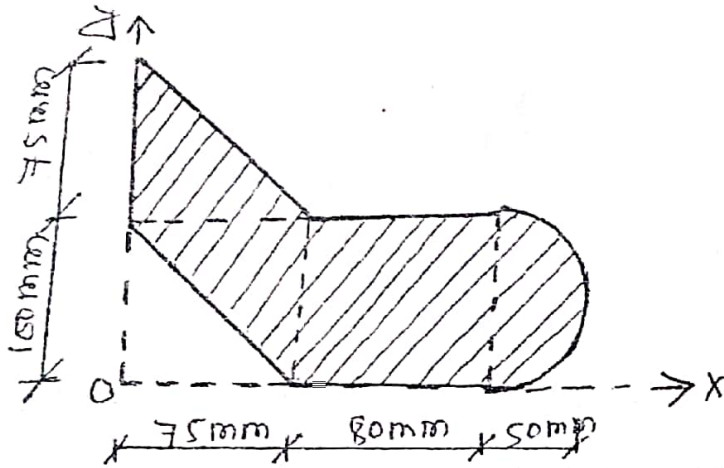
- 2(a) Find the centre of gravity for the triangle shown in fig. below. 6



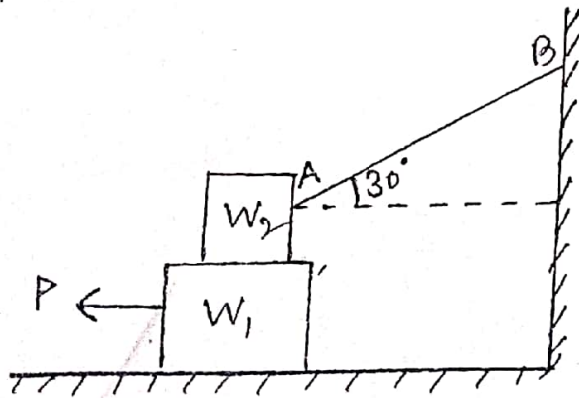
Contd. ...

(2)

- (b) Find the moment of inertia of the plane lamina shown in fig. with reference to the origin 'O'. 10

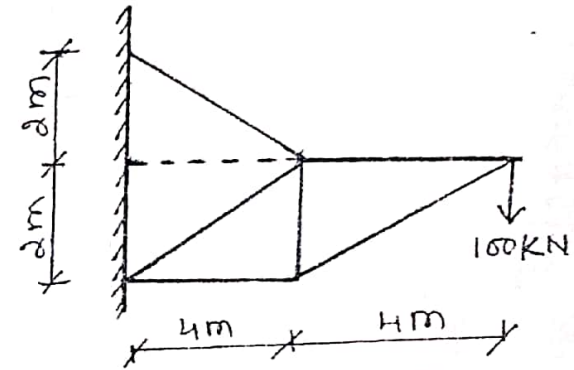


- 3(a) Calculate the force 'P' required to cause the block of weight 'W₁' slide under the block of weight 'W₂'. What will then be the tension in the string 'AB'. Take W₁ = 2000N and W₂ = 1000N and $\mu = 0.3$. 8

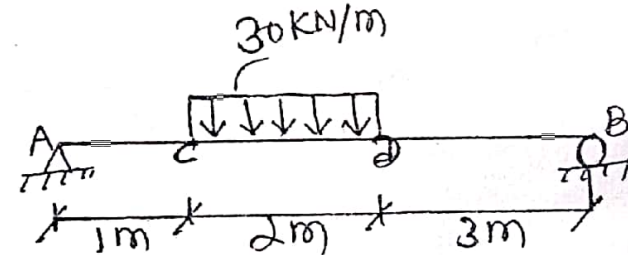


(3)

- (b) Find the force in all members of the truss shown in fig. indicate the results in a tabular form. 8



- 4(a) Determine total pressure force and position of centre of pressure for inclined plane surface.
- (b) A simply supported beam 6m long carry a uniformly distribute load (UDL) of 30kN/m over 2m of its span as shown in fig. Draw S.F.D. and B.M.D. Calculate the maximum bending moment. 1



Group-B

- 5(a) Deduce the relation for tangential and normal components acceleration when a particle is moving curvilinear.

Contd. ...

Contd.

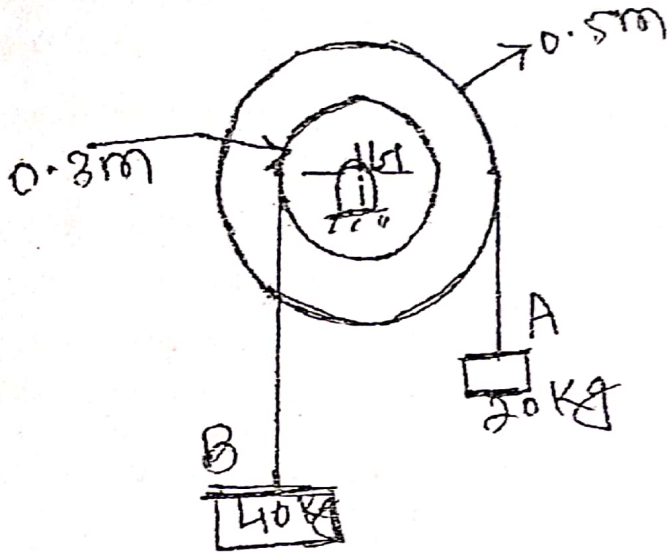
(5)

What do you mean by general plane motion of the rigid body?
Illustrate with an example.

6

A 50kg pulley having a radius of gyration of 0.4m is connected to two cylinders as shown in fig. Assuming no axle friction determine the angular acceleration of the pulley and the acceleration of each cylinder.

10



$I = 50 \times 0.4^2$
 $I = 8 \text{ kg m}^2$
 $\tau = 20g$
 $\tau = I\alpha$
 $20g = 8\alpha$
 $\alpha = \frac{20g}{8}$
 $\alpha = 2.5g$
 $\alpha = 24.5 \text{ m/s}^2$

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

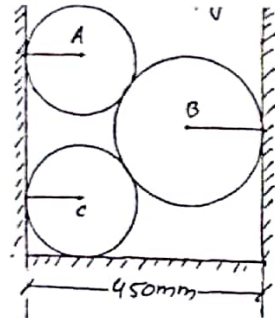
All questions carry equal marks. The marks allotted for each sub-question specified along its side.

Answer FIVE questions selecting at least TWO from each GROUP.

Group-A

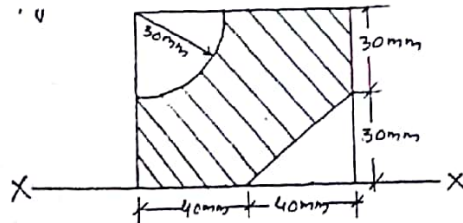
- a) Define the term 'Rigid Body'. 'Deformed Body' with suitable example to support your answer. 2+2+2
- b) The weights and radii of the three cylinders piled in a rectangular ditch as shown in fig. are as given below,

Cylinder	Weight	Radius
A	80 N	100 mm
B	100 N	200 mm
C	80 N	100 mm



Assuming all contact surface to be smooth determine the reaction on cylinder C. 10

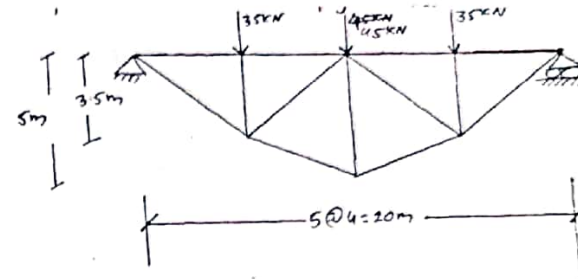
- i) Describe the conditions illustrating tipping and sliding of a block with neat figure. 6
- ii) Compute the moment of inertia of the shaded area shown in fig. about x-x axis. 10



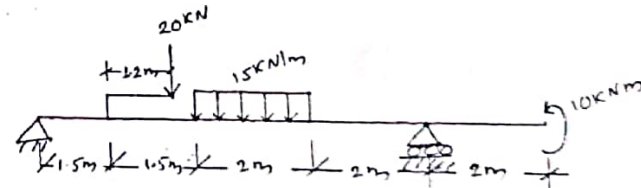
Contd. ...

(2)

- 3(a) Define the principle of Transmissibility. Do you agree on "couple as a free vector". Support your answer. 2+4
- (b) Calculate the forces in the inclined members of the truss as in fig. below. 10



- 4(a) Prove that center of pressure (C.P.) is always below the C.G. of the immersed object. 6
- (b) Draw S.F.D. and B.M.D. for the beam as shown in fig.



Group-B

- 5(a) Define the term kinetics and kinematics. Also describe rectilinear, curvilinear and plane curvilinear motion of a particle with example. 1+1+2+2+2
- (b) The motion of a particle is defined by the position vector $\vec{v} = 6t\vec{i} + 4t^2\vec{j} + t^3/4\vec{k}$ where r is in meter and t is in second. At the instant, when $t = 3\text{sec}$. Find the unit position vector, velocity and acceleration. 8
- 6(a) Define instantaneous centre of rotation. Illustrate the location of instantaneous centre of rotation in various case. 1+5

9

Contd. ...

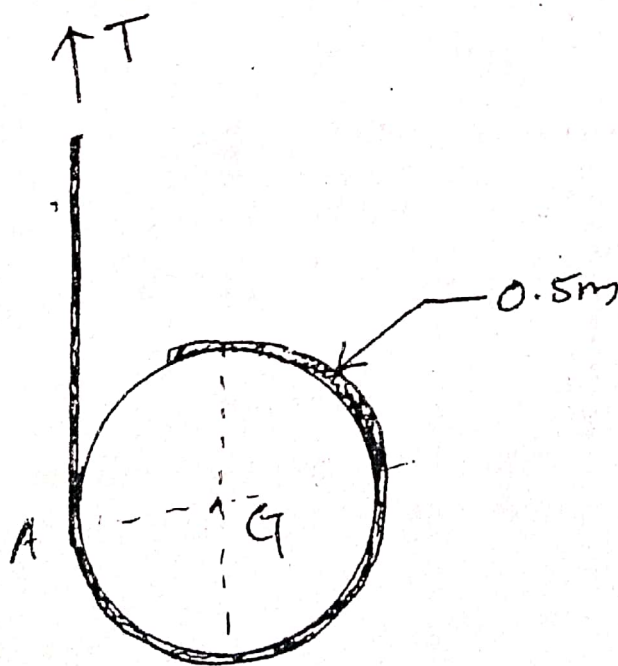
(3)

(b) A bullet is fired upward at an angle of 30° to the horizontal from a point P on a hill and it strikes a target which is 80m lower than the level of projection. The initial velocity of the bullet is 100m/s. Calculate:

- (a) The maximum height to which the bullet will rise above the horizontal
- (b) The actual velocity with which it will strike the target
- (c) The total time requirement for the flight of the bullet neglect the resistance due to air.

7(a) Define general plane motion. Derive the expression for the kinetic energy in plane motion of a rigid body. 10
1+5

(b) A cord is pulled upward with force T of magnitude 180N. Determine (a) the acceleration of the centre of the disk (b) the angular acceleration of the disk (c) the acceleration of the cord. 10



PURBANCHAL UNIVERSITY

2018

B. E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG176CO: Object-Oriented Programming (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 EIGHT questions.

8×10=80

- 1(a) What is object oriented programming? Discuss the need of object oriented programming. 2+3
- (b) Write a program to find sum of first and last element of an array demonstrating use of new and delete operator. 5
- 2(a) When will you make a function inline and why? Write a suitable program in c++ showing inline function. 2+3
- (b) How function overloading is achieved? Write a program to compare two integer numbers and two single characters using function overloading. 2+3
- 3(a) Is it mandatory to use constructor in a class? Explain the need for having more than one constructors in a class. 1+3
- (b) Write a program to copy content of one object into another object of a class named "BOX" and length, breadth and height as its data members. 6
- 4(a) Mention rules for overloading an operator. 3
- (b) Write a program to overload == operator to compare two strings. 7
- 5(a) Define inheritance Explain different forms of inheritance with their syntax. 5
- (b) What is function over ridding. Explain with example. 1+4
- 6(a) Describe different methods of opening a file. 3
- (b) Write a program to write the name, roll and marks of 10 students in the file and read the name of student securing highest mark from the file. 7

Contd. ...

(2)

- 7(a) What is an exception? Why is it necessary to handle in programming? 1+2
- (b) Write a program using class template to arrange N numbers of type int and float in descending order. 7
- 8(a) How does a class accomplish data hiding? 2
- (b) Define a class to represent a bank account. Include the following members: 8

Data members:

- (i) Name of depositor
- (ii) Account number
- (iii) Type of Account
- (iv) Balance amount in the account

Member function:

- (i) To assign initial values
- (ii) To deposit in an account
- (iii) To withdraw an amount after checking the balance
- (iv) To display name and balance

Write the program to test the program.

9. Write short notes on any TWO: 2×5=10
- (a) This pointer
 - (b) Virtual function
 - (c) Manipulators



PURBANCHAL UNIVERSITY

2016

B. E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

EEG176CO: Object-Oriented Programming (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 are specified along its side.

Answer **EIGHT** questions.

8×10=80

- (a) What is Object Oriented Programming (OOP)? Describe the basic characteristics of object-oriented programming. Mention any three drawbacks of procedure oriented languages. 2+2+2
- (b) Discuss importance and limitation of inline function. 4
- (a) Define type casting with an example. Discuss constant pointer and pointer to a constant with example. 2+3
- (b) Construct an overloaded function equivalent to the pow (x, n) where x can be either integer or float and n is an integer. 5
- (a) What are friend functions? Is it possible for a function to be friend of two different classes? If yes, then how it is implemented in C++. Explain with a suitable example. 1+6
- (b) What do you mean by function overriding? Explain. 3
- (a) Explain copy constructor in C++. Why is destructor function required in class? 2+2
- (b) What do you mean by static variable and static function? Explain with an example. 2+2
- (a) Define a class ACCOUNT that includes 10 following members:
Data Members: Name of Depositor, Account no., Type of A/c, Balance Amount.
Member functions: To assign initial values, deposit amount, withdraw after checking balance to display name and balance. 7

Contd. ...

(2)

- 6(b) Differentiate between early and late binding. 3
- 5(a) What do you mean by operator overloading? Write a program to overload the unary minus operator using friend function. 2+6
- 7(a) List out the operators that can't be overloaded in C++. 2
- 7(a) Define multiple inheritance with its syntax. Write a program to demonstrate the use of constructor in derived class. 2+6
- 6(a) What is the difference between a virtual function and a pure virtual function? 2
- 6(a) What do you mean by exception Handling? Explain briefly. 4
- (c) Write a program which asks for a file name from the keyboard, opens a file with that name for output, reads a line from the keyboard character by character and writes the line onto the file. 6
- 6(a) What is stream? Describe the Input/ Output class hierarchy in brief. 2+3
- (b) Write a temple function to find the maximum number from a template array of size N. 5

PURBANCHAL UNIVERSITY

2015

B. E. (Civil/Computer/Electronics & Comm.)/Second Semester/Chance/Back.

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG176CO: Object-Oriented Programming

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.

8×10=80

- 1(a) How are data and functions organized in an OOP approach? List the applications of OOP. 5
- (b) What is a class? How does it accomplish data hiding? 5
- 2(a) What is inline function? What are the advantages of using inline function? 4
- (b) WAP to find the volume of cube, sphere and cylinder using function overloading. 6
- 3(a) Explain different types of constructors with syntax. 4
- (b) Write an OOP to show that a friend function can access members of two classes. 6
- 4(a) What is operator overloading? Write the rules of overloading unary and binary operators. 4
- (b) Write an OOP to add two complex numbers using passing objects as arguments. 6
- 5(a) What are multiple and multilevel inheritance? Write an OOP to implement multilevel inheritance. 2+6
- (b) How are static members declared in C++? 2
- 6(a) What is virtual function? Explain how run time polymorphism is achieved using a program. 2+6
- (b) What are the possible types of data conversion? 2

Contd. ...

(2)

- 7(a) What is a file mode? Describe the various file mode options available. 1+3
- (b) WAP to read a text from the file named "hello.txt" to the file named "test.txt". 6
- 8(a) What is an exception? How is an exception handled in C++? Give example. 5
- (b) Write the function template to swap the numbers. 5
9. Write short notes on any FOUR: 4×2.5=10
- (a) this Pointer
 - (b) Namespace
 - (c) Default arguments
 - (d) Benefits of inheritance
 - (e) Generic programming

≡

BEG176CO: Object-Oriented Programming

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.

- (a) What is object-oriented programming? What are its important features? 6
- (b) Mention the purpose of dot operator and scope resolution operator. 4
- (a) Define function overloading. Write a program to overload a function "sum" which calculates sum of squares of the inputs if two inputs are provided and sum of cubes of the inputs if three inputs are provided. 2+5
- b) What is an inline function? What are its restrictions? 3
- a) What is a friend function? What are its characteristics? 4
- b) Write an object-oriented program to add two complex numbers using friend function. 6
- a) Define constructor and explain its types. 4
- b) Write a program to define a class "string". Using constructor, initialize two string objects with given strings and write necessary functions to concatenate and display the strings. 6
-) What are the rules of overloading unary and binary operators? Give proper syntax. 4
- Write an OOP to overload "==" operator to determine the equality of two fractional numbers. (Fractional numbers must be in terms of numerator and denominator). 6
- Define multiple and multilevel inheritance with syntax. 4

Contd. ...

BEG176CO: Object-Oriented Programming C++

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.

- 1(a) What are the characteristics of object oriented programming? Explain. 5
- (b) Justify the need of scope resolution operator for accessing global variables. 5
- 2(a) What is the difference between inline function and normal function? Write an interactive program with an inline function to find maximum value of two numbers. 5
- (b) Write a program to print sum of all squares between 1 and N Where N is number entered from keyboard i.e.
 $1 + 4 + 9 + \dots + (N^2)$ 5
- 3(a) What is the difference between structure and classes in C++? Give example. 5
- (b) Write a program to add two vectors. Use concept of class and objects. 5
- 4(a) What is the importance of operator overloading? List out operators that cannot be overloaded. 3
- H.W. (b) Write a program to convert angle in degree to angle in radian where,
 Angle in radian = Angle in degree * Pi/180.0. Use conversion routing in source class. 5

Contd. ...

Q1. What are the base and derived classes? Create a base class named and derived class called MyStack. Write a program to use these classes for manipulating objects. 2+3

(b) What are virtual classes? Explain the need of virtual classes while building class hierarchy. 2+3

5(a) What are constructor and destructor? Write a syntax of implicit and explicit call of parameterized constructor with example. 5

(b) Distinguish between early binding and late binding. 5

6(a) Correct the error in following program and include missing components.

```

Class XYZ
{
    int a;
    Public:
    +
    void main ()
    {
        XYZ a1;
        a1. read ();
        a2. show ();
        XYZ a2 = 10;
        a2. show ();
    }
}

```

(b) Explain how virtual function differs from pure virtual function. Write down rule of virtual functions. 3+2

Create class student to store name and roll of n students into a file. Write a program to search data of particular student in a file according to roll asked by user. 10

What are templates? Explain different types of template with example. 10

Write short notes on: 5*2=10

- (a) File pointers (b) STL
- (c) Exception Handling (d) Function overloading
- (e) Manipulators

(7)

(b) Create a class "shape" with data members "width" and "height". From this class, derive the classes "rectangle" and "triangle" with member functions to input the necessary values and to calculate the area. (Area of Rectangle = width * height and Area of Triangle = $\frac{1}{2}$ * height * width. Include necessary derivations and member functions to display the calculated areas. 6

7(a) What is a virtual function? How does it support run-time polymorphism? Explain with an example. 7

(b) Explain "this" pointer. 3

8(a) Mention the use of width() and fill () with examples. 4

(b) Write a program to enter the name and salary for a number of employees, store them all in a file, and finally search and display the salary of the particular employee whose name is entered for searching. 6

9(a) Define template. Write a program using class template to swap two sets of numbers (one integer set and another floating-point set). 1+6

(b) What is exceptional handling mechanism in C++? 6

10. Write short notes on any FOUR: 4*2.5=10

- (a) Destructors
- (b) New and delete operators
- (c) Static data member
- (d) Namespace
- (e) Private and public derivation
- (f) Type conversion

PURBANCHAL UNIVERSITY

2009

B. E. (Civil/Computer/Electronics & Comm.)/Second

Semester/Chance

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG176CO: Object-Oriented Programming C++

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 specified along its side.

Answer EIGHT questions.

- 1) What is object oriented programming? Explain briefly the different characteristics of OOP. 2+6
- 2) What is reference variable?
 i.e. provides an alternative name for alternative a previously defined variable.
 Syntax: datatype & reference_name = variable_name;
- 1) Explain inline function with its demerit. 4
- 2) Write a program to find the volume of cube, cuboid and sphere showing function overloading. 6
- 3) What is class? How is it declared? 2
- 4) Write a program to implement the use of "this" operator. 4
- 5) Explain the importance of friend function with example. 4
- 6) Write a program to illustrate of passing object as function argument. 6
- 7) Differentiate between run time polymorphism and compile time polymorphism. 4
- 8) Explain briefly about constructor and destructor. Explain different types of constructor with suitable example. 3+5
- 9) What is abstract base class? 2
- 10) What is operator overloading? Write a program for conversion from class type to basic type. 6
- 11) What are the different types of inheritance? 4

Contd. ...

PURBANCHAL UNIVERSITY

2013

B. E. (Computer/Electronics & Comm.)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG176CO: Object-Oriented Programming

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.

- 1(a) Discuss the need of object oriented programming? In what way procedural programming is different from object oriented programming? 2+3
- (b) Write a program in C++ for student registration in which the student is required to enter his/her name, age and address. The entries should be displayed on screen. 5
- 2(a) Does C++ allow you to call function without specifying all its arguments?
 Yes, function assigns a default value to the parameter which doesn't have matching arguments at function call.
 Write a program to calculate the area of circle, rectangle and triangle using inline function.
 Area of circle = πr^2
 Area of rectangle = length x breadth
 Area of triangle = $1/2 \times \text{base} \times \text{height}$ 1+5
- (b) Define function overloading? Describe the importance of function overloading. 4
- 3(a) What are the advantage and disadvantage of friend functions? 4
- (b) Write a program to add two time object in format (yy:mm:dd), initializing values to the objects and passing object as the argument. The result should display in time format. 6
- 4(a) Define is constructor? Make a class program to illustrate the following types of constructor. 1+6
 - (a) Default constructor
 - (b) Parameterized Constructor
 - (c) Copy constructor

Contd.

(2)

(b) What is data conversion? Write a program to overload '+' operator.

1+2

5(a) What is difference between multiple inheritance and multilevel inheritance? 3

(b) Create a class called info with member data to store name, age, and address of a person. Create another class called academic info with member data to represent highest academic degree gained. From these two classes, derive a class called employee which in addition to above attributes contains other attributes professional status. Use member functions to read and print all the attributes of an employee. 7

6(a) What is file pointer? Describe its type with their function? 1+3

(b) Write a program to enter the name, reg_no, and grade of 10 students and store them in file. Read and display the contents of file. 6

7(a) What is abstract class? How they are useful. 2+2

(b) Define virtual function. Distinguish between early binding and late binding. 2+4

(a) What do you understand by generic programming? Write a program for function template to display the integer numbers, floating point numbers, and characters. 5

b) Make a small program to illustrate the working of try, throw, and catch mechanism. 5

Write short note on any TWO: 2×5=10

(a) Inheritance

(b) Namespace

(c) Static data member and member function

≡

(2)

7(a) Create a class student that stores name (a string) and roll (type int). From this class derive a class marks that adds sub1 (type float), sub2 (type float) that stores the marks for subjects. Then from the class marks derive a class record which adds semester type (type int) and average (type float), average is the average marks of the sub1 and sub2 defined in class marks.

(b) Define namespace with its syntax.

8(a) What is inheritance? Write a program to implement hierarchical inheritance.

(b) What is virtual function?

9(a) What is stream? Write down the method of opening the data stream.

(b) Write a program to create a file "stud.txt" in which the following operations are performed:

(i) Add a new student record (should contain id, name, semester, address) in the file.

(ii) Modify the details of a student whose name is "XYZ".

(iii) Display the contents of file.

10(a) Explain function template and class template with their syntax.

(b) Explain the exceptional handling model of C++ with various constructs supported by it.

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PURBANCHAL UNIVERSITY

2018

B. E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG171CO: Digital Logic (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) Explain about the importance of digital system. 5
- (b) Convert: $(3FB.BE)_{16} = (?)_{10}$ 3
- (c) Using 2's complement find $(10011)_2 - (1011)_2$. 3
- (d) Express the Boolean function $F = \overline{A}B + AC$ in to the product of max terms. 5
- 2(a) Explain about full adder with design procedure. 6
- (b) Design the function $F(X,Y,Z) = \Sigma(0,1,3)$ using only NAND gates. 4
- (c) Design the BCD adder circuit. 6
- 3(a) Describe about the decoder with diagram. 8
- (b) Why NAND and NOR gates are called universal gate? Explain with logic diagram. 8
- 4(a) Implement the Boolean function $F(A,B,C) = \Sigma(2,4,5,6)$ with MUX. 4
- (b) Explain in detail about the JK flip flop. 4
- (c) Draw the circuit 4 bit up down counter. 8
- 5(a) Draw the circuit 4 bit serial in parallel out shift register. 8
- (b) Differentiate between combinational and sequential logic circuit. 4
- (c) Explain about status register. 4
6. Write short notes on any FOUR: 4×4=16
- (a) DTL NAND gate (b) PLA
- (c) Subtractor (d) Memory unit
- (e) CMOS



PURBANCHAL UNIVERSITY

2016

Computer/E. & C./Electrical/Second Semester/Final

03:00 hrs.

Full Marks: 80 / Pass Marks: 32

7100: Digital Logic (New Course)

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

Questions carry equal marks. The marks allotted for each sub-question are specified along its side.

Answer FIVE questions.

5×16=80

1) What is digital system? What is the significance of binary number in digital system. Explain. 1+3

2) State and prove De-Morgans theorem. 4

3) Obtain the minimal expression for $f(ABC) = \sum m(1, 2, 4, 6, 7)$ and implement it using universal. 4

4) What is Boolean algebra? List the basic identities of Boolean algebra. 1+3

5) What are logic gates? Explain various logic gates with their logic symbol and truth table and their mathematical interpretation. 8

6) Encode the decimal number 46 to BCD, Excess-3 and Gray code. 3

7) Convert $(623.77)_8$ to decimal, binary and hexadecimal. 5

8) What is sequential logic circuit? Design a Full adders with two half adders and an OR gate. 3+5

9) Design a 4-bit BCD to Excess-3 code converter. 8

10) What is Multiplexer? Design 8×1 multiplexer using 4×1 multiplexer. 3+4

11) What is programmable logic array (PLA)? Explain. 3

12) What is Flip-flop? Explain the working of basic flip flop circuit with the help of logic diagram and truth table. 6

13) Design a counter using T flip flop which will count in 0,1,3,7,6,4,0 sequence. 6

14) What is shift register? Explain the working of serial in serial out shift register. 1+5

15) Write short note on ALU. 4

Contd. ...

(2)

1. Explain the working mechanism of Ripple counter.

4

3×4=12

2. Write short notes on any THREE:

(i) Status register

(ii) ECL logic family

(iii) Magnitude Comparator

(iv) Johnson counter

22

PURBANCHAL UNIVERSITY

2015

B. E. (Computer/E. & C./Electrical)/Second Semester/Final/Chance/Back

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG171CO: Digital Logic

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) Convert $(1101011.0101011)_2$ into decimal, octal and hexadecimal. 4.

(b) Convert $(29)_{10}$ into excess-3 code. 2.

(c) Subtract $(11010)_2$ from $(1011)_2$ using complement. 4.

(d) Prove that: $2+2$

(i) $(X + Y)' (X' + Y') = 0$.

(ii) $X \oplus Y \oplus Z = X'Y'Z + X'YZ' + XY'Z' + XYZ$.

2(a) What is a binary parallel adder and why is a look ahead carry generator used? $\begin{matrix} 16 \\ +2 \\ \hline 14 \\ +2 \\ \hline 14 \\ \hline 3 \end{matrix}$ 6

(b) Design a circuit that compares two 4-bit numbers A and B. The circuit has three outputs: x to show $A > B$, Y to show $A < B$ and Z is to show $A = B$ else all remain 0. 7

(c) Define multiplexer and demultiplexer circuit. Draw the logic circuit diagram and block diagram of 16:1 multiplexer and 1:16 demultiplexer logic circuit. 1+5

3(a) Design BCD to seven segment decoder. 5 6

(b) What do you mean by an encoder? Describe working of octal-to-binary encoder with logic diagram and truth-table. 1+6

(c) Describe about Programmable Logic Array (PLA) with block diagram. 3

Contd. ...

- 4(a) A sequential circuit has two flip-flops (A and B), two inputs (X and Y), and an output (Z). The flip-flop input function and circuit output function are as follows:

$$J_A = XB + \overline{Y}B, K_A = X\overline{Y}B$$

$$J_B = X\overline{A}, K_B = X\overline{Y} + A$$

$$Z = XYA + \overline{X}YB$$

Obtain the logic diagram, state-table and state-diagram. 9

- (b) Define a shift register and describe bidirectional shift register with parallel load by the help of logic diagram. 7

- 5(a) Design mod-3 counter and sketch the wave forms for output when clock is applied. 4+4

- (b) Describe 4-bit shifter with diagram. 6

- (c) List out the name of different logic families. 2

6. Simplify the following:

(a) (i) $F(X, Y, Z) = \sum(1,3,4,6)$.

(ii) $F(X, Y, Z) = \prod(0, 2, 5, 7)$ and also draw their simplified logic circuit. 7

- (b) Design a full subtractor. 6

- (c) What is advantage of octal and hexadecimal number over binary number? 1

- (d) Are there any difference between 4-bit BCD code and 4-bit excess-3 code data representation? If Yes/No, give reason with suitable example. 2

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PURBANCHAL UNIVERSITY

2014

E. (Computer/E. & C./Electrical)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG171CO: Digital Logic

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 specified along its side.

Answer FIVE questions.

- 1(a) Explain about the use of digital system. 5
- 1(b) Use 'quick method' for the Conversions: 2
 (i) $(ABCD)_{16} = (?)_2$ (ii) $333_8 = (?)_2$
- 1(c) Convert: 4
 $(1010100)_{\text{excess3code}} = (?)_{10}$
 $(10101)_2 = (?)_8$
- 1(d) Use 2's complement method to perform $-58 + (-32)$. 5
- 2(a) What is a logic gate? Describe each fundamental gates with truth table, logic symbol and logic expression. 6
- 2(b) What is the significance of Karnaugh's map? Minimize $X = \overline{ABC} + \overline{BCD} + \overline{ABCD} + \overline{ABC}$ using K-map. *it provides a simple straight forward procedure for minimizing boolean functions* 5
- 2(c) State De-morgan's theorem. 3
- 2(d) Describe the symbols ' Σ ' & ' Π '. *ANDing of minterms* $\overline{ABC} = \overline{A} + \overline{B} + \overline{C}$ 2
- 3(a) What is a full adder? Implement a full subtractor using NOR gates only. *ORing of minterms* 2+4
- 3(b) Design a 4 bit parallel adder circuit. 6
- 3(c) Design a 2-bit magnitude comparaoer which gives high output for equal numbers. 4
- 4(a) Draw a 4×1 MUX and describe how it operates. 5

Contd. ..

PURBANCHAL UNIVERSITY

2010

B.E. (Computer/Electronics & Comm.)/Third Semester/Chance

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG23GEC: Digital Electronics

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) Convert $(2AC5.D)_{16}$ to decimal, octal and binary. 3
- 1(b) (i) Perform the following subtraction using 2's complement: $(10010)_2 - (10011)_2$. 2
- (ii) Perform the following subtraction using 9's complement: $(5250)_{10} - (321)_{10}$ 2
- 1(c) Define parity bit. Why NAND gate is called a universal gate? 1+2
- 1(d) Simplify the Boolean function with don't care, 'd' to represent it in product of sums with minimum number of literals. Also realize the simplified function with logic gates. 6
 $F(W_1X_1Y_1Z) = \Sigma(1,3,7,11,15) + d \Sigma(0,2,5)$
 $D(W_1X_1Y_1Z) = \Sigma(0,2,5)$
- 2(a) Discuss about a combinational logic and sequential logic circuit. Implement a full adder circuit with a decoder and two OR gates. 4+6
- 2(b) Design a combinational logic circuit that takes binary input of three bits and produces binary output that is equal to the square of the corresponding input number. 6
- 3(a) Implement a Boolean function below using a suitable multiplexer. $F_1(A, B, C, D) = A'B'C'D' + A'B'CD + A'BCD' + A'BCD + ABC'D' + ABCD$. 8
- 3(b) Implement Boolean functions below using ROM circuitry. 3

Contd. ...

(2)

(b) Describe JK flipflop with its logic diagram, characteristic table, characteristic equation and excitation table. 7

(c) Describe state diagram with example. 4

5(a) Design a binary counter with the following binary sequence 0, 1, 3, 2, 6, 4, 5, 7 and repeat. 7

(b) Construct MOD6 counter. 5

(c) Explain the working of ripple counter. 4

6(a) Explain about a simple processor organization. 4

(b) Describe an arithmetic circuit with one selection variable S and two n-bit data inputs A and B. The circuit generates the following four arithmetic operations in conjunction with the input carry C_{in} . Draw the logic diagram for the first two stages.

$S C_{in} = 0$	$C_{in} = 1$
$0 D = A+B$	$D = A + 1$
$1 D = A - 1$	$D = A + B + 1$

(c) Write short notes on any TWO: 2+2

(i) RTL

(ii) Shift register

(iii) CMOS

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(2)

$$F_1(A, B, C) = \sum(0, 4, 6, 7)$$

$$F_2(A, B, C) = \sum(1, 2, 3, 5)$$

When would you prefer to use PLA instead of ROM for digital logic implementation?

4(a) Define triggering of a flipflop. Explain about T-flipflop and JK flipflop in detail. 2+3+

(b) Design a counter using T-Flipflops with the following counting sequence.

001, 010, 100, 111, 101, 110, 000

5(a) Explain in detail about a four-bit parallel in serial out shift register with necessary details including timing diagram. Assume the initial state of the register to be 1101.

(b) Explain in detail about the design of an arithmetic circuit of processor.

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

(a) Full subtractors

(b) PLA (Program Logic Array)

(c) Ripple counter

(d) Status Register

(e) Transistor-Transistor Logic

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Digital

PURBANCHAL UNIVERSITY

2013

B. E. (Computer/Electronics & Comm.)/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG171CO: Digital Logic

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 mean by Binary system? Describe the significance of this system in digital circuits. 4

(b) Convert the following: 4

(i) $200_{10} = (?)_2$ binary

(ii) $FACE_{16} = (?)_2$

(iii) $10100_2 = (?)_8$

(iv) $27_{10} = (?)$ Gray code

(c) Perform the subtraction operation $21-12$ in 2's complement system. 4

(d) What is binary code? Explain briefly. 4

2(a) What are universal gates? Construct 2 input XOR gate using any one universal gate. 4

(b) State and verify De-Morgan's theorem. 4

(c) What is k-map? Solve the expression $F(A,B,C) = \sum(0,1,3,5) + \sum(2,7)$ using k-map. 2+4

(d) What the symbols \sum and Π signify? 2

3(a) Design any one code converter circuit. 6

(b) Differentiate multiplexer and de-multiplexer circuit. 6

(c) Implement in hardware a 3-bit magnitude comparator having one output that goes HIGH when the two 3-bit numbers are equal. Use only NAND gates. 4

Contd. ...

(2)

4(a) What is flip-flop? Write down excitation table, characteristics table and state equation of J-K flip-flop. 7

(b) Draw a diagram of 6-bit serial in parallel out shift register and explain how it works. 7

(c) Differentiate between register and counter. 2

5(a) Differentiate synchronous and asynchronous systems. 2

(b) Design a counter with the binary sequence 0,1,3,2,0. 6

(c) Design an arithmetic circuit with one selection variable 3 and two n-bit data inputs A and B. The circuit generates the following four arithmetic operations in conjunction with the input carry C in. Draw the logic diagram for the first two stages: 8

S	$C_{in}=0$	$C_m=1$
0	$D=A+B$	$D=A+1$
1	$D=A-1$	$D=A+\bar{B}+1$

6(a) Explain the circuit operation of RTL with necessary circuit diagram. 6

(b) Explain the working of sifter with neat diagram. 6

(c) Write short note on ECL circuit. 4

