



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 154204

Roll No.

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B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15
ELEMENTARY MATHEMATICS-II

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions.

SECTION - A

1 Attempt all parts of the following : **10×2=20**

(a) Solve : $x^2 - x + 2 = 0$

(b) Solve for real x : $\frac{3(x-2)}{5} \leq \frac{5(2-2)}{3}$

(c) If ${}^n C_9 = {}^n C_8$, find ${}^n C_{17}$.

(d) How many terms of the A.P. $-6, -\frac{11}{2}, -5, \dots$ are needed to give the sum -25 .

(e) Write the equation of a line passing through the point $(-4, 3)$ with slope $\frac{1}{2}$.

- (f) Find the radius and centre of the circle
 $x^2 + y^2 - 8x + 10y - 12 = 0$.
- (g) Find $\vec{a} \times \vec{b}$ if $\vec{a} = \hat{i} - 5\hat{j} + 3\hat{k}$ and
 $\vec{b} = 3\hat{i} + 4\hat{j} - 2\hat{k}$.
- (h) Find the projection of the vector $\vec{a} = 2\hat{i} + 3\hat{j} - 2\hat{k}$ on
the vector $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$.
- (i) If the line has direction ratios 2, -1, -2, determine its
direction cosines.
- (j) Find the direction cosines of a vector
 $\vec{AB} = 3\hat{i} + 4\hat{j} + 5\hat{k}$.

SECTION - B

- 2** Attempt any three parts of the following : **3×10=30**
- (a) Solve the following system of inequalities graphically
 $x - 2y \leq 3$, $3x + 4y \geq 12$, $x \geq 0$, $y \geq 1$.
- (b) Find the sum to n terms of the series :
 $5 + 11 + 19 + 29 + 41 \dots\dots$
- (c) Find the equation of the circle passing through the
points (-5, 4) and (7, -2) whose centre lies on the line
 $3x + 4y = 7$.
- (d) Find the unit vector perpendicular to each
of the vector $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ where
 $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$.

- (e) Find the equation of the plane through the line of intersection of the planes $x+y+z=1$ and $2x+3y+4z=5$, which is perpendicular to the plane $x-y+z=0$.

SECTION - C

Note : Attempt any two parts from each question. $(2 \times 5) \times 5 = 50$
All questions are compulsory.

- 3 (a) Solve : $x^2 + x + \frac{1}{\sqrt{2}} = 0$
- (b) Solve the inequality and show the graph of the solution on the number line $3(1-x) < 2(x+4)$
- (c) Solve : $-3x+2y \geq -6$ graphically.
- 4 (a) Find the value of n such that

$${}^n P_5 = 42 {}^n P_3, n > 4$$

- (b) Prove that ${}^n C_r + {}^n C_{r-1} = {}^{n+1} C_r$

- (c) How many terms of the G.P. $3, \frac{3}{2}, \frac{3}{4}$ are needed to

give the sum $\frac{3069}{512}$?

- 5 (a) Find the equation of the line passing through $(-3, 5)$ and perpendicular to the line through the point $(2, 5)$ and $(-3, 6)$.
- (b) Find the coordinates of the focus, axis, the equation of the directrix and latus rectum of the parabola $y^2 = 8x$.
- (c) Find the equation of the ellipse whose vertices are $(0, \pm 13)$ and foci are $(0, \pm 5)$.
- 6 (a) Find the vector in the direction of a vector $\hat{i} - 2\hat{j} + 3\hat{k}$ that has magnitude 13 units.
- (b) Show that the points $A(3\hat{i} - 4\hat{j} - 4\hat{k})$, $B(2\hat{i} - \hat{j} + \hat{k})$ and $C(\hat{i} - 3\hat{j} - 5\hat{k})$ are the vertices of a right angled triangle.
- (c) Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$.
- 7 (a) Find the direction cosines of the line passing through the points $(-2, 4, -5)$ and $(1, 2, 3)$.
- (b) Find the Cartesian equation of the line which passes through the point $(-2, 4, -5)$ and parallel to the line give by $\frac{x+3}{3} = \frac{y-4}{5} = \frac{3+z}{6}$
- (c) Find the angle between the planes $2x + y - 2z = 5$ and $3x - 6y - 2z = 7$ using vector method.