Printed Pages : 4

EBT201

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

PAPER ID : 154204

Roll No.

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 $x : \dfrac{3(x-2)}{5} \leq \dfrac{5(2-2)}{3}$

(c)   If $^nC_9 = {}^nC_8$, find $^nC_{17}$.

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

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

154204]   **1**   **[Contd...**

(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 ....

(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.   **(2×5)×5=50**
All questions are compulsory.

3 (a) Solve : $x^2+x+\dfrac{1}{\sqrt{2}}=0$

(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
$$^nP_5=42\,^nP_3,\ n>4$$

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

(c) How many terms of the G.P. $3,\dfrac{3}{2},\dfrac{3}{4}$ are needed to give the sum $\dfrac{3069}{512}$?

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 $\dfrac{x+3}{3} = \dfrac{y-4}{5} = \dfrac{3+8}{6}$

       (c)   Find the angle between the planes $2x + y - 2z = 5$ and $3x - 6y - 2z = 7$ using vector method.