

**MATH-113 APPLIED MATHEMATICS – I**

COMMON WITH AUTO-MOBILE & DIESEL, AUTO & FARM MACHINERY, AUTOMATION, ARCHITECTURE, CAST METAL & FOUNDRY, CHEMICAL, CIVIL, CMT, DIE & MOULD, FOUNDRY & PATTERN MAKING, FOOTWEAR, GLASS & CERAMICS, HEAT VENTILATION, AIR CONDITIONING & REFRIGERATION, LEATHER, LAND & MINE SURVEYING, MINING, MECHANICAL, METALLURGY & WELDING, MECHATRONICS, PRECISION MECHANICAL & INSTRUMENT, PGA, PETROLEUM, PETROCHEMICAL, QUANTITY SURVEY, RAC, SUGAR, TEXTILE SPINNING, TEXTILE DYEING & PRINTING & TEXTILE WEAVING TECHNOLOGIES.

**PAPER 'B' (Subjective)**

Time: 2:30 Hours

SECTION – I

Marks: 60

Q.1: Write short answer to any Eighteen (18) questions: -

$18 \times 2 = 36$

1. Define isosceles triangle.
2. Write the area of an equilateral triangle with side 'a'.
3. The area of a rectangle is 20 sq.cm and one of its side is 4cm long. Find its breadth and the perimeter of the rectangle.
4. The perimeter of a Rhombus is 140cm and one of the opposite angle is  $30^\circ$ . Find its area.
5. Find the area of trapezoid whose parallel sides are 20cm and 30cm and perpendicular distance between them is 4cm.
6. Define inscribed polygon.
7. The perimeter of a regular hexagon is 12cm, find its area.
8. What is the area and circumference of circle of radius 'r'.
9. Write the formula of Area of the minor segment when angle is ' $\theta$ ' and radius 'r' are given.
10. The base of a right prism is an equilateral triangle with a side of 4cm and its height is 25cm, find its volume.
11. The volume of the cube is 95 cu.cm. Find the surface area and the edge of the cube.
12. A rectangular cuboid 9cm long and 7cm wide given that the volume of the cuboid is  $315\text{cm}^3$ . Find the height of the cuboid.
13. Find the cost of digging a well 3m in diameter and 24m in depth at the rate of Rs.10 per cu. m.
14. Find the diameter of the cylinder if its volume is  $704\text{cm}^3$  and height is 14cm.
15. Find the volume of a pentagonal based pyramid whose area of base is 15 sq. cm and height is 15cm.
16. Find the volume of the largest cone that can be cut out of a cube whose edge is 3cm.
17. How many cu. ft. of gas are necessary to inflate a spherical balloon to a diameter of 60 inch?
18. What is unit vector.
19. Find the magnitude of the vector  $-2\mathbf{i} - 4\mathbf{j} + 3\mathbf{k}$ .
20. Find the unit vector parallel to the sum of the vector.  $\vec{a} = [2, 4, -5]$  and  $\vec{b} = [1, 2, 3]$
21. Find a vector whose magnitude is 2, and is parallel to  $5\hat{i} + 3\hat{j} + 2\hat{k}$ .
22. For what value of ' $\lambda$ ', the vectors  $2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$  &  $3\mathbf{i} + 2\lambda\mathbf{j}$  are perpendicular.
23. Define scalar matrix.
24. Show that 
$$\begin{vmatrix} b & -1 & a \\ a & b & 0 \\ 1 & a & b \end{vmatrix} = b^3 + a^3$$
25. Find 'x' and 'y' if: 
$$\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix} = \begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix}$$
26. Find 'k' if  $A = \begin{bmatrix} 4 & k & 3 \\ 7 & 3 & 6 \\ 2 & 3 & 1 \end{bmatrix}$  is a singular matrix.
27. Find  $A^{-1}$  if  $A = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$

SECTION - II

Note: Attempt any three (03) questions.

3 × 8 = 24

- Q.2. (a)** From the point within an equilateral triangle perpendicular are drawn to the three sides are 6, 7 and 8cm respectively. Find the area of triangle.
- (b)** Regular polygons of 15 sides are inscribed in and circumscribed about a circle whose radius is 12cm. Show that the difference of their areas is nearly 20 square cm.
- Q.3. (a)** Following ordinates of equal intervals are drawn in a plot of base 1200 meters. Find the area by Simpson's rule if these ordinates are 50, 60, 80, 90, 30, 50, 60, 80, 70, 90, 100, 120, 130meters.
- (b)** A 10cm cube of cast iron is melted and cast into a hexagonal prism with a height of 12cm. Find the side of the base of prism.
- Q.4. (a)** Find the whole surface of a pyramid whose base is an equilateral triangle of side 3m and its slant height is 6m.
- (b)** Find the cost of canvas, at the rate of Rs.5 per square meter, required to make a tent in the form of a frustum of a square pyramid. The sides of the base and top are 6m and 4m respectively and the height is 8m, taking no account of waste.
- Q.5. (a)** Given the vectors  $\vec{a} = 3\vec{i} - 2\vec{j} + 4\vec{k}$  and  $\vec{b} = 2\vec{i} + \vec{j} + 3\vec{k}$  find the magnitude and direction cosines of  $3\vec{a} - 2\vec{b}$ .
- (b)** Find the Sine of the angle between the vectors:  $\vec{a} = \vec{i} + \vec{j} + \vec{k}$  and  $\vec{b} = 2\vec{i} + 3\vec{j} - \vec{k}$
- Q.6.** Use Cramer's rule to solve the following system of equation:
- $$\begin{aligned}x - 2y + z &= -1 \\3x + y - 2z &= 4 \\y - z &= 1\end{aligned}$$