

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 × 2 = 36

1. Find the area of a triangle whose two adjacent sides are 16cm and 12cm and their included angle is 30°.
2. What is the side of the equilateral triangle whose area is $9\sqrt{3}$ sq.cm.
3. Find the area of trapezoid whose parallel sides are 20cm and 30cm and perpendicular distance between them is 4cm.
4. Define a cyclic quadrilateral and write its area.
5. Define circumscribed polygon.
6. Find the interior angle of hexagon.
7. Find the radius of a circle the area of which is 9.3129 sq.cm.
8. Write the area of the segment in terms of height and length of the chord of the segment.
9. If base of a field is 50m and number of ordinates are 11, then find breadth of strip.
10. The volume of the cube is 95 cu.cm. Find the surface area and the edge of the cube.
11. Find the height of the cylinder if volume is 528cm³ and diameter is 4cm.
12. The height of pyramid with square base is 12cm, and its volume is 100cu.cm. Find length of side of square base.
13. The circumference of base of a 9m high conical tent is 44m, find the volume of the air contained in it.
14. Write formula for volume of a cone.
15. A solid cylinder of glass the radius of whose base is 9cm and height 12cm is melted and turned into a sphere. Find the radius of the sphere so formed.
16. Find the volume of a segment of a sphere whose height is $4\frac{1}{2}$ cm and diameter for whose base is 8cm.
17. The base of a right prism is an equilateral triangle with a side of 4cm and its height is 25cm, find its volume.
18. Find unit vector along the vector $4\mathbf{i} - 3\mathbf{j} - 5\mathbf{k}$.
19. Find $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b})$ if $\vec{a} = 2\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$ & $\vec{b} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$.
20. If $\vec{a} = 2\mathbf{i} + 3\mathbf{j} + 4\mathbf{k}$ & $\vec{b} = \mathbf{i} - \mathbf{j} + \mathbf{k}$ Find $|\vec{a} \times \vec{b}|$.
21. Prove that \vec{a} and \vec{b} are perpendicular to each other if $\vec{a} = \mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$ & $\vec{b} = \mathbf{i} - \mathbf{j} - \mathbf{k}$
22. Find 'α' so that $|\alpha\mathbf{i} + (\alpha + 1)\mathbf{j} + 2\mathbf{k}| = 3$.
23. Define row and column vectors.
24. Find 'x' and 'y' if $\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix} = \begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix}$
25. Find A^{-1} if $A = \begin{bmatrix} 5 & 3 \\ 1 & 1 \end{bmatrix}$.
26. Find 'k' if $\begin{vmatrix} k-2 & 1 \\ 5 & k+2 \end{vmatrix} = 0$
27. What is the cofactor of 3 in matrix. $\begin{bmatrix} 3 & 1 & -4 \\ 2 & 5 & 6 \\ 1 & 4 & 8 \end{bmatrix}$

SECTION - II

Note: Attempt any three (03) questions.

$3 \times 8 = 24$

- Q.2. (a)** The hypotenuse of a right triangle is 10cm and its height is twice of its base. Find the area of triangle.
- (b)** The diagonals of a rhombus are 80cm and 60cm respectively. Find the area and length of each side.
- Q.3. (a)** The area of regular octagonal room is 51sq.cm. Find the length of its side.
- (b)** The axis of an ellipse are 40cm and 60cm. Find its perimeter and area.
- Q.4.** Find area of the field whose ordinates are 0, 20, 22.5, 33.5, 45, 42, 33.5, 25.5 and 0 meter respectively. The width of each strip is 14m. Find also the approximate cost of purchasing the field at a cost of Rs. 5,000/per sq.m.
- Q.5. (a)** For what value of m the vector $4\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$ and $m\mathbf{i} - \mathbf{j} + \sqrt{3}\mathbf{k}$ have same magnitude.
- (b)** Find the sine of the angle and the unit vector perpendicular to each if $\vec{a} = \mathbf{i} + \mathbf{j} + \mathbf{k}$ and $\vec{b} = 2\mathbf{i} + 3\mathbf{j} - \mathbf{k}$.
- Q.6. (a)** Find the inverse of $\begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 4 \\ 0 & 2 & 2 \end{bmatrix}$
- (b)** Use Cramer's rule to solve the system of equations. $\begin{cases} 3x - 4y = -2 \\ x + y = 6 \end{cases}$
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