

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 unit vector along the vector $4\mathbf{i} - 3\mathbf{j} - 5\mathbf{k}$.
2. Given the vectors $\vec{a} = 3\mathbf{i} + \mathbf{j} - \mathbf{k}$ and $\vec{b} = 2\mathbf{i} + \mathbf{j} - \mathbf{k}$, find magnitude of $3\vec{a} - \vec{b}$.
3. Define Vector product.
4. Find scalar x and y such that: $x(\mathbf{i} + 2\mathbf{j}) + y(3\mathbf{i} + 4\mathbf{j}) = 7\mathbf{i} + 9\mathbf{j}$
5. Find the real numbers x, y and z such that $(x + 4)\hat{\mathbf{i}} + (y - 5)\hat{\mathbf{j}} + (z - 1)\hat{\mathbf{k}} = 0$
6. Define Diagonal matrix.
7. Evaluate $\begin{vmatrix} 1 & 2 & -2 \\ -1 & 1 & -3 \\ 2 & 4 & -1 \end{vmatrix}$
8. If $\begin{bmatrix} 1 & -1 & 2 \\ 3 & 2 & 5 \\ -1 & 0 & 4 \end{bmatrix}$ & $B = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 3 & 4 \\ -1 & 2 & 1 \end{bmatrix}$ find $A - B$.
9. Define the minor of an element of a matrix.
10. What is the cofactor of 4 in matrix $\begin{bmatrix} 3 & 1 & -4 \\ 2 & 5 & 4 \\ 1 & 4 & 8 \end{bmatrix}$
11. Define isosceles triangle.
12. Find the area of a triangle whose two adjacent sides are 16cm and 12cm and their included angle is 30° .
13. Find the base of a parallelogram whose area is 256sq.cm and height 32cm.
14. The diagonals of a Rhombus are 6 and 8 cm respectively. Find the length of the side of Rhombus.
15. Define inscribed polygon and circumscribed circle.
16. Write the area of regular polygon of 'n' sides when the radius of the circumscribed circle 'R' is given.
17. Define area of the Annulus (Ring).
18. Write the formula of Areas of the minor segment and major segment when angle is 'θ' and radius 'r' are given.
19. Find the area of the whole surface of a right triangular prism whose height is 36cm and sides of whose base are 51, 37 and 20cm, respectively.
20. Write the formula which is used to find volume and total surface area of polygon prism.
21. Write the Simpsons Rule.
22. Write the formula of volume of cylinder if radius is given.
23. Find the height of the cylinder if volume is 528cm^3 and diameter is 4cm.
24. Find the volume of a pyramid with a square base of side 10cm and height 15cm.
25. If 'a' is the side of the base of polygon, h is the height and ℓ is the slant height of a regular pyramid, the find: (i) Lateral surface area (ii) Total surface area
26. Define cone.
27. The area of cross-section of a prism is 52sq.m. What is the weight of the frustum of the prism of the smallest length is 10cm and the greatest length is 24.3 cm? Density of material 0.29 Lb/cu.cm.

SECTION - II

Note: Attempt any three (03) questions.

3 × 8 = 24

Q.2. (a) If the position vectors of \vec{A} and \vec{B} are $5\hat{i} - 2\hat{j} + 4\hat{k}$ and $\hat{i} + 3\hat{j} + 7\hat{k}$ respectively, find the magnitude and direction cosines of \vec{AB} .

(b) Using cross product, find the area of triangle whose vertices are (0, 0, 0), (1, 1, 1), (0, 0, 3).

Q.3. (a) Prove that:
$$\begin{vmatrix} \sin\alpha & \cos\alpha & 0 \\ -\sin\beta & \cos\beta & \sin\gamma \\ \cos\beta & \sin\beta & \cos\gamma \end{vmatrix} = \sin(\alpha + \beta + \gamma)$$

(b) By use of Determinant's properties Verify that:
$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (b - c)(c - a)(a - b)$$

Q.4. (a) In a quadrilateral the diagonal is 125cm and the two perpendicular on it from the other two angles are 19cm and 25cm respectively, find the area.

(b) A road 10m wide is to be made around a circular plot of 75m diameter. Find the cost of the ground needed for the road at Rs.40.00 per square meter.

Q.5. (a) Find the 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 the approximate cost of purchasing the field at a cost of Rs. 5,000/per sq.m.

(b) The diameter of right circular cylinder is 38cm and its length is 28cm. Find its volume, lateral surface and total surface.

Q.6. (a) Find the slant surface of a right pyramid whose height is 65m and whose base is a regular hexagon of side $48\sqrt{3}$ m.

(b) The slant height of a cone is 25cm, and the area of its curved surface is 550sq.cm. Find its volume.

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