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. What are parallel vectors?

2. Given the vectors: $\vec{a} = 3i - 2j + k$, $\vec{b} = 2i - 4j - 3k$, $\vec{c} = -i + 2j + 2k$. Find $\vec{a} + \vec{b} + \vec{c}$.

3. If $\vec{a} = 2i + 3j + 4k$ & $\vec{b} = i - j + k$ Find $\left| \vec{a} \times \vec{b} \right|$

4. Prove that $\vec{a}$ and $\vec{b}$ are perpendicular to each other if $\vec{a} = i + 3j - 2k$ & $\vec{b} = i - j - k$.

5. If the vectors $3i + j - k$ and $\lambda i - 4j + 4k$ are parallel, find value of 'λ'.

6. Define identity matrix.

7. Show that $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & -3 \\ 3 & -3 & 6 \end{bmatrix}$ is symmetric.

8. Find 'x' and 'y' if $\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix} = \begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix}$

9. Find the inverse of $\begin{bmatrix} 2 & 1 \\ 6 & 3 \end{bmatrix}$

10. Find A^{-1} if $A = \begin{bmatrix} 5 & 3 \\ 1 & 1 \end{bmatrix}$

11. Define plane figure.

12. A triangular blank of equal sides is to punch in a copper plate, the area of the blank should be 24 sq.cm find the side.

13. If the perimeter of a square is 40cm. Find the area of the square.

14. The diagonals of a rhombus are 40cm and 30cm, find its area.

15. Define a polygon.

16. The perimeter of a regular hexagon is 12cm, find its area.

17. Find the radius of a circle the area of which is 9.3129 sq.cm.

18. Write the area of the segment in terms of height and length of the chord of the segment.

19. Three cubes of metal whose edges are 3, 4 and 5cm respectively, are melted without any loss of metal into a single – cube. Find
    (i) edge of the new cube   **(ii)** surface area of the new cube.

20. The dimension of a marriage hall are 100m, 50m and 18m respectively, find volume of the hall.

21. If base of a field is 50m and number of ordinates are 11, then find breadth of strip.

22. In a hollow cylinder, the circles of cross-section are concentric. If the internal diameter of these circles be 2.2cm and 3.8cm respectively and the height be 6.5cm, find the volume of hollow interior.

23. Find the diameter of the cylinder if its volume is 704cm³ and height is 14cm.

24. Define pyramid.

25. Let A_1 be the area of the base, and A_2 be the area of the top, a is the side of the base and b is the side of the top ℓ is the slant height and h is the height of the frustum of a pyramid, then find **(i)** Volume of the frustum of a pyramid.   **(ii)** Lateral surface area.

26. Define sphere.

27. Find the volume of a segment of a sphere whose height is $4\frac{1}{2}$ cm and diameter for whose base is 8cm.

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SECTION − II

Note: **Attempt any three (03) questions.** $3 \times 8 = 24$

Q.2. **(a)**   Show that the vectors 4i − 6j + 9k and $-6i + 9j - \dfrac{27}{2}k$ are parallel.

(b)   Find $\left|\left(\vec{a} \times \vec{b}\right) \times \vec{c}\right|$ if $\vec{a} = i - 2j - 3k$, $\vec{b} = 2i + j - k$, $\vec{c} = i + 3j - 2k$.

Q.3. **(a)**   If $A = \begin{bmatrix} 2 & -2\sqrt{2} \\ \sqrt{2} & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2\sqrt{2} \\ -\sqrt{2} & 2 \end{bmatrix}$, show that A and B commute.

(b)   Find the inverse if it exists, of the matrix. $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 4 \\ 0 & 2 & 2 \end{bmatrix}$

Q.4. **(a)**   A track round the inside of a rectangular grassy plot 40m by 30m occupies 600 sq.m show that the width of the track is 5m.

(b)   The distance between the corners of a hexagonal nut is 2.28 cm. Find the distance between the jaws of the wrench needed to fit this nut.

Q.5. **(a)**   Find area of an irregular figure by Simpson's Rule if the ordinates are 9, 11, 13, 12, 10, 13, 15, 17, 14, 12, 7 meters and base is 73 meters.

(b)   The length, width and height of a rectangular prism are 6, 4 and 3 meters respectively. Find the volume, the surface area and the length of the diagonal.

Q.6. **(a)**   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.

(b)   Find the curved and total surface area and the volume of the frustum of a cone whose top and bottom diameters are 6m and 10m and the height is 12m.

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