DAE/IA-2015/06 FIRST YEAR

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. Find the magnitude of the vector $\vec{a} = 2i - 4j + 3k$

2. Find a unit vector parallel to the sum of the vectors: $\vec{a} = [2, 4, -5]$, $\vec{b} = [1, 2, 3]$

3. Find a vector whose magnitude is 2 and is parallel to $5i + 3j + 2k$

4. Show that the vectors $\vec{a} = 3i - j + 7k$, $\vec{b} = -6i + 3j + 3k$ perpendicular to each other.

5. Find the area of parallelogram with adjacent sides, $\vec{a} = 7i - j + k$, $\vec{b} = 2j - 3k$.

6. Define symmetric matrix.

7. Show that $A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{bmatrix}$ is a singular matrix.

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. Without expansion verify that $\begin{vmatrix} \alpha & \beta+\gamma & 1 \\ \beta & \gamma+\alpha & 1 \\ \gamma & \alpha+\beta & 1 \end{vmatrix} = 0$

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

11. Define Isosceles triangles.

12. Find the area of a triangle whose two adjacent sides are 16cm and 12cm and their included angle is 30º.

13. Define inscribed polygon (circumscribed circle).

14. Find the area of regular hexagon circumscribed about a circle of radius 2cm.

15. A path 14cm wide, surrounds a circular lawn whose diameter is 360cm. Find the area of the path.

16. Find the area of a segment the chord of which 8cm with a height of 2cm.

17. Find the area of cross-section of river along a line where the depths at equal interval of 10m are noted 0, 7, 11, 15, 0 meters respectively.

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

19. Find the area of the whole surface of a right triangular prism whose height is 36m and the sides of whose base are 51, 37 and 20m.

20. A brick measures 18cm by 9cm by 6cm. Find the number of bricks that will be needed to build a wall 450cm wide, 18cm thick and 360cm high.

21. The cylinder of an air compressor is required to have a working volume of 5 cu. m. if the radius is 5/6m, what must be the stroke.

22. The diameter of the base of a right circular cylinder is 14cm and its height is 10cm. Find the volume and surface area of solid cylinder.

23. Find the volume of a pyramid whose base is an equilateral triangle of side 1m and whose height is 4m.

24. A square pyramid has a volume 60 cu.cm and the side of the base is 6cm. Find the height of the pyramid.

25. The circumference of base of a 9m high conical tent is 44 m. Find the volume of the air contained in it.

26. Find the cost of painting @ Rs. 7.5 per sq. cm a conical spire 64cm in circumference at the base and 108cm in slant height.

27. A spherical cannon ball, 6cm in diameter is melted and cast into a conical mould, the base of which is 12cm in diameter. Find the height of the cone.

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SECTION – II

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

Q.2: From a point within an equilateral triangle perpendicular are drawn to the three sides are 6, 7 and 8 cm respectively. Find the area of triangle.

Q.3: Find the area enclosed by the curve $y = 6x - x^2$ and the positive x-axis and y-axis by Simpson's Rule.

Q.4: A pyramid on a square base has every edge 100m long. Find the edge of a cube of equal volume.

Q.5: **(a)** Find the vector whose magnitude is 5 and which is in the direction of the vector $4i - 3j + k$?

(b) Find the sine of the angle between the vectors $\vec{a} = i + j + k$ and $\vec{b} = 2i + 3j - k$

Q.6: Use Cramer's rule to solve the system of equations: $\begin{cases} x - 2y + z = -1 \\ x + z = 2 \\ -2x + 3y = 5 \end{cases}$

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