DAE/IIA-2019/06 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 unit vector along the vector $4i - 3j - 5k$.
2. Find 'α' so that $\left|\alpha i + (\alpha+1)j + 2k\right| = 3$
3. Find a vector whose magnitude is 2, and is parallel to $5\hat{i} + 3\hat{j} + 2\hat{k}$.
4. For what value of 'λ', the vectors $2i - j + 2k$ & $3i + 2\lambda j$ are perpendicular.
5. Find scalar x and y such that: $x(i + 2j) + y(3i + 4j) = 7i + 9j$.
6. Without expansion, show that : $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} = 0$
7. Find the inverse of $\begin{bmatrix} 2 & 1 \\ 6 & 3 \end{bmatrix}$
8. Solve by using Cramer's Rule: $x - y = 2$, $x + 4y = 5$
9. Find 'k' if $\begin{vmatrix} k-2 & 1 \\ 5 & k+2 \end{vmatrix} = 0$
10. Define a co-factor of an element of a matrix.
11. Find the area of a triangle whose base is 12cm and hypotenuse is 20cm.
12. What is the side of the equilateral triangle whose area is $9\sqrt{3}$ sq.cm.
13. Find the base of a parallelogram whose area is 256sq.cm and height 32cm.
14. Find the area of trapezoid whose parallel sides are 20cm and 30cm and perpendicular distance between them is 4cm.
15. The perimeter of a regular hexagon is 12cm, find its area.
16. What are concentric circles.
17. Find the area of the curve $y = x^2$ between the values x = 1 and x = 7?
18. Find surface area of cube of volume $64cm^3$.
19. The curve surface of a cylinder is 100sq.m and diameter of the base is 20m. Find height and volume of cylinder.
20. Find the height of the cylinder if volume is $528cm^3$ and diameter is 4cm.
21. Define pyramid.
22. Find the volume of a pyramid with a square base of side 10cm and height 15cm.
23. Write the formula for volume of a cone and total surface area of a cone.
24. Find the volume of the largest cone that can be cut out of a cube whose edge is 3cm.
25. Write formula of curved surface area of cone and slant height of cone.
26. Define spherical shell.
27. How many lead balls, each of radius 1cm can be made from a sphere whose radius is 8cm.

SECTION – II

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

Q.2. (a) If $\vec{a} = 3i - 2j + 5k$ and $\vec{b} = -2i - j + k$, find $2\vec{a} - 3\vec{b}$ and also its unit vector.

(b) Find the sine of the angle and the unit vector perpendicular to each:

$\vec{a} = i + j + k,\ \vec{b} = 2i + 3j - k$

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) Show that: $\begin{vmatrix} \ell & a & a \\ a & \ell & a \\ a & a & \ell \end{vmatrix} = (2a + \ell)(\ell - a)^2$

Q.4 The sides of a triangular lawn are proportional to the numbers 5, 12 and 13. The cost of fencing it at the rate of Rs.2 per meter is Rs.120. Find the sides, also find the cost of turning the lawn at 25 paisa per square meter.

Q.5. (a) Find the area of an irregular plane figure whose ordinates are 20, 23, 28, 32, 34, 37 and 40m respectively and the width of each strip is 7 meter.

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

Q.6. (a) Find the volume of a pyramid whose base is an equilateral triangle of side 3m and height 4m.

(b) A circular disc of lead 3cm in thickness and 12cm diameter is wholly converted into shots of radius 0.5cm. Find the number of shots.

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