MODEL QUESTION - 2077

Grade: 11

Time: 3 hours Mahtematics (Mat.007) **F.M.:** 75

Attempt all the questions

Group 'A' $[11 \times 1 = 11]$

Rewrite the correct option in your answer sheet.

1. Which one of the following is a statement ?
   A. The fishes are beautiful.
   B. Study mathematics.
   C. x is a capital of country y.
   D. Water is essential for health.

2. The alue of : $\sqrt{-16} \times \sqrt{-25}$ is
   A. -20 B. $-20i$ C. $20i$ D. 20

3. If $\angle C = 60°, b = 5$ cm and $a = 4$ cm of ΔABC, what is the value of c ?
   A. 3.58 cm B. 4.58 cm C. 4.89 cm D. 4.56 cm

4. In a triangle $ABC, B = 120°, a = 1, c = 1$ then the other angles and sides are
   A. 35,45,$\sqrt{2}$ B. 10,15, $\sqrt{3}$ C. 20, 40, 2 D. 30, 30, $\sqrt{3}$

5. The cosine of the angle between the vector $\vec{a} = \vec{i} - 2\vec{j} + 3\vec{k}$ and $\vec{b} = \vec{i} + 3\vec{j} + 3\vec{k}$ is
   A. $\frac{1}{14}$ B. 14 C. $\sqrt{14}$ D. 196

6. The equation of parabola with the vertex at the origin and directrix $y - 2 = 0$ is..
   A. $x^2 - 8y = 0$ B. $y^2 + 8y = 0$ C. $x^2 + 8y = 0$ D. $y^2 - 8y = 0$

7. A mathematical problem is given to three students Sumit, Sujan and Rakesh whose chance of solving it are $\frac{1}{2}, \frac{1}{3}\ \frac{1}{a}$ respectively. The probability that the the problem is solved is $\frac{3}{4}$. The possible values of a are
   A. $\frac{9}{2}$ B. 4 C. $\frac{1}{4}$ D. $\frac{1}{8}$

8. $\lim_{\theta \to 0} \frac{\sin\theta}{\theta}$ is equal to
   A. 0 B. ∞ C. 1 D. $\frac{0}{0}$

9. The derivative of $\frac{4x^2 + 3}{3x^2 - 2}$ is ...
   A. $\frac{-34x}{(3x^2 - 2)^2}$ B. $\frac{30x^2}{3x^2 - 2}$ C. $\frac{-32x}{(3x^2 - 2)^3}$ D. $\frac{-31x}{(3x - 2)^2}$

10. By Newton's Rapshon, the positive root of $x^3 - 18 = 0$ in (2,3) is
    A. 2.666 B. 2.621 C. 2.620 D. 2.622

11. The forces actiong at an angle of 45° have a resultant equal to $\sqrt{10}N$, if one of the forces be $\sqrt{2}N$, what is the other force.
    A. $1N$ B. $2N$ C. $3N$ D. $4N$

    OR

    The total cost function of a producer is given as $C = 500 + 30Q + \frac{1}{2}Q^2$, Which of the following is the marginal cost(MC) at $Q = 4$?
    A. $Rs.38$ B. $Rs.34$ C. $Rs.30$ D. $Rs.28$

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Group 'B' $[8 \times 5 = 40]$

12. A function $f(x) = x^2$ is given. Answer the following question for the function $f(x)$.
    (i) What is the algebraic nature of the function ?
    (ii) Write the name of the locus of the curve.
    (iii) Write the vertex of the function.

(iv) Write any one property for sketching the curve.

(v) Write the domain of the function.

13. Compare the sum of n terms of the series: $1 + 2a + 3a^2 + 4a^3$..... and $a + 2a + 3a + 4a$..... upto n terms.

14. (a) In any triangle, prove that:
$(b + c)\sin\frac{A}{2} = a\sin\left(\frac{A}{2} + B\right)$ (3)

(b) Express $\vec{r} = (4, 7)$ as the linear combination of $\vec{a} = (5, -4)$ and $\vec{b} = (-2, 5)$ (2)

15. Calculate the appropriate measure of Skewness for the date given below.

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
Workers	10	12	25	35	40	50

16. Define different types of discontinuity of a function. Also write the condition for increasing, decreasing and convavity of function. (2+3)

17. Evaluate: $\int \frac{x^2 dx}{\sqrt{a^2 - x^2}}$

18. Define Trapezoidal rule. Evaluate using Trapezoidal rule for $\int_0^1 \frac{dx}{1+x} n = 4$.

19. State sine law and use it to prove Lami's theorem.

OR

A decline is the price of good X by Rs. 5 causes an increase in its demand by 20 units to 50 units. The new price of X is 15.

(a) Calculate elasticity of demand.

(b) The elasticity of demand is negatie, what does it mean?

. **Group 'C'** $[8 \times 3 = 24]$

20. (a) The factors of expression $\omega^3 - 1$ are $\omega - 1$ and $\omega^2 + \omega + 1$. If $\omega^3 - 1 = 0$

i. Find the possible values of ω and write the real and imaginary roots of ω. (2)

ii. Prove that: $\begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^{2n} & 1 & \omega^n \\ \omega^n & \omega^{2n} & 1 \end{vmatrix} = 0$, where n is positive integer. (4)

(b) Veryfy that:
$|x + y| \leq |x| + |y|$ with $x = 2$ and $y = -3$. (2)

21. (a) The single equation of pair of lines is $2x^2 + 3xy + y^2 + 5x + 2y - 3 = 0$.

i. Find the equation of pair of straight lines represented by the single equation. (4)

ii. Are the pair of lines represented by the given equation passes through origin? Write with reason. (1)

iii. Find the point of intersection of the pair of lines. (2)

(b) If three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are mutually perpendicular unit vectors in space then write a realation between them. (1)

22. (a) Distinguish between derivative and anti-derivative of a function. Write their physical meanings and illustrate with example in your context. Find the differential coefficient of $\log\sin x$ with respect to x. (1+2+2)

(b) Find the area bounded by the $y-$axis, the curve $x^2 = 4(y-2)$ and the line $y = 11$. (3)

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