Sub.Code :0071

GRADE XI

Mathematics

Model questions

विद्यार्थीले सकेसम्म आफ्नै शब्दमा उत्तर दिनुपर्नेछ । दायाँ किनारामा दिइएको अङ्कले पूर्णाङ्क जनाउँछ ।

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Time : 3 Hrs. Full Marks: 75

Attempt all the questions

Group A **(1 × 11 = 11)**

Rewrite the correct option in your answer sheet

1. Which 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 value of : $\sqrt{-16} \times \sqrt{-25}$ is

   (a) -20 (b) -20i (c) 20i (d) 20

3. If $\angle C = 60^0$, 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

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, 50, $\sqrt{3}$ (c) 20, 40,2 (d) 30, 30, $\sqrt{3}$

5. The cosine of the angle between the vectors $\vec{a} = \vec{\imath} - 2\vec{\jmath} + 3\vec{k}$ and $\vec{b} = \vec{\imath} + 3\vec{\jmath} + 3\vec{k}$ is

   (a) $\frac{1}{14}$ (b) 14 (c) $\sqrt{14}$ (d) 196

6. The equation of parabola with the vertex at the origin and the 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 $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{a}$ respectively. The probability that 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 derivatives 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 Raphson, 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. Two forces acting 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 $C = 500 + 30Q + \frac{1}{2}Q^2$ .What is the marginal cost (MC) at Q = 4 is

(a) Rs.38 (b) Rs.34 (c) Rs.30 (d) Rs.28

Group B **(5 × 8 = 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: $1 + 2a + 3a^2 + 4a^3 + \ldots\ldots\ldots$and $a + 2a + 3a + 4a \ldots$up to n terms.

14. a) In any triangle, prove that: $(b + c) \sin {}^{A}/_{2} = a \sin(\frac{A}{2} + B)$ (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 data below.

Class	0-10	10-20	20-30	30-40	40-50	50-60
No of workers	10	12	25	35	40	50

16. Define different types of discontinuity of a function. Also write the condition for increasing, decreasing and concavity 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 in the price of good X by Rs. 5 causes an increase in its demand by 20 units to 50 units. The new price is X is 15.

(i) Calculate elasticity of demand.

(ii) The elasticity of demand is negative, what does it mean?

Group – C **(8 × 3 = 24)**

20. (a) The factor of expression ω^3-1 are ω-1 and $\omega^2 + \omega + 1$. If ω^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) Verify 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 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 relation between them. (1)

22. (i) 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 logSinx with respect to x. (1+ 2+2)

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