A–6–Y

Roll No.....

Total No. of Questions : 29] [*Total No. of Printed Pages* : 4

XIARWZJD21
5706–Y
MATHEMATICS

Time : 2.30 Hours] **[Maximum Marks : 100**

Objective Type Questions 1 each

1. If the set A has 3 elements and the set B = {3, 4, 5}, then the number of elements in (A × B) = ... (Fill in the blank)

2. The range of the Signum function $f : R \to R$ is the set {–1, 0, 1}. (True/False)

3. $\lim_{x \to 0} \frac{\sin x}{x}$ is equal to :

   (A) cos x (B) –cos x

   (C) 1 (D) –1

4. $\frac{d}{dx}(\sec x)$ = ...

   (A) cosec x (B) sec x tan x

   (C) cosec x cot x (D) – cosec x

Very Short Answer Type Questions 2 each

5. If R is the set of real numbers and Q is the set of rational numbers, then what is R—Q ?

6. Find the multiplicative inverse of complex number $\sqrt{5} + 3i$.

7. Evaluate :

$$\frac{z^{1/3} - 1}{z^{1/6} - 1}$$

8. For some constants a and b, find the derivative of $\frac{x - a}{x - b}$.

9. Find the slope of the line passing through the points (3, −2) and (−1, 4).

10. A die is thrown repeatedly until a six comes up. What is the sample space for this experiment ?

11. Using binomial theorem evaluate $(96)^3$.

12. Find the sum of odd integers from 1 to 2001.

Short Answer Type Questions 4 each

13. In a group of 70 people, 37 like coffee, 52 like tea and each person likes at least one of the two drinks. How many people like both coffee and tea ?

14. Find the domain and range of the real functions $f(x) = \sqrt{9 - x^2}$

15. Prove by using the principle of Mathematical induction for all $n \in N$:

$$1^3 + 2^3 + 3^3 + \ldots\ldots + n^3 = \left[\frac{n(n+1)}{2}\right]^2$$

16. Find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum of $x^2 = 6y$.

17. Convert the complex number $(1 - i)$ in the polar form.

18. Find the derivative of cos x from first principle.

Or

Find the derivative of the function :

$$\frac{\sin x + \cos x}{\sin x - \cos x}$$

19. Find the equation of the right bisector of the line segment joining the points (3, 4) and (–1, 2).

20. If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, find :

(i) P(E or F)

(ii) P(not E and not F)

21. Find the coefficient of x^6y^3 in the expansion of $(x + 2y)^9$.

22. Find the ratio in which the *yz*-plane divides the line segment formed by joining the points (–2, 4, 7) and (3, –5, 8).

23. Write the negation of the statements :

(I) All triangles are not equilateral triangle

(II) The number 2 is greater than 7.

Long Answer Type Questions 6 each

24. Find the general solution for equation :

$$\cos 3x + \cos x - \cos 2x = 0$$

Or

Find the value of $\tan \frac{\pi}{8}$.

25. Find n :

(i) If ${}^{n-1}P_3 : {}^{n}P_4 = 1 : 9$

(ii) If ${}^{2n}C_3 : {}^{n}C_3 = 12 : 1$

Or

Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination.

26. Prove that :

$$\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$$

27. Find the equation for the ellipse that satisfies the conditions :

foci $(\pm 3, 0)$, $a = 4$

28. The diameters of circles drawn in a design are given below :

Diameters	33–36	37–40	41–44	45–48	49–52
No. of Circles	15	17	21	22	25

Calculate the standard deviation and mean diameter of the circles.

29. In an A.P. if pth term is $\frac{1}{q}$ and qth term is $\frac{1}{p}$, prove that the sum of first pq terms is $\frac{1}{2}(pq + 1)$; where $p \neq q$.

Or

Evaluate :

$$\sum_{k=1}^{11} (2 + 3^k)$$