XIARKD21

5805-B

MATHEMATICS

Time : 2.30 Hours]

[Maximum Marks : 100

Section-A

(Objective Type Questions)

1 each

1. What is the 6th term of the sequence whose nth term is $a_n = (n - 1)(n - 2)(n - 3)$?

2. Solve the inequality for real x :

$$3x - 7 > 5x - 1.$$

3. $\sec\left(\dfrac{\pi}{2} + x\right)$ is equal to :

   (A) sec x

   (B) cosec x

   (C) —cosec x

   (D) None of these

4. Define a simple event.

Section-B

(Very Short Answer Type Questions)

5. Write the following set in set-builder form B = {5, 25, 125, 625}.

6. Find the value of $\sin \dfrac{31\pi}{3}$.

7. **Find the multiplicative inverse of 2 − 3i.**

8. **Evaluate :**

$$\lim_{x \to -1} \frac{x^{10} + x^5 + 1}{x - 1}$$

9. **Find the derivative of the function :**

   2 tan x − 7 sec x

10. Find the 4th term in the expansion $(x - 2y)^{12}$.

11. Find the equation of the line passing through the point (−4, 3) with slope 1/2.

12. How many terms of the A.P. −6, $\dfrac{-11}{2}$, −5, ... are needed to give the sum −25 ?

Section–C

(Short Answer Type Questions)
4 ea

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

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

15. Show that :

$$\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$$

16. If three points $A(h, 0)$, $B(a, b)$ and $C(0, k)$ lie on a line, show that :

$$\frac{a}{h} + \frac{b}{k} = 1$$

17. Find the modulus and argument of the complex number $\frac{1+2i}{1-3i}$.

18. Find the equation of the circle which passes through the points (2, -2) and (3, 4) and whose centre lies on the line $x + y = 2$.

19. Find the equation of set of points P such that $(PA)^2 + (PB)^2 = 2k^2$, where A and B are the points (3, 4, 5) and (-1, 3, -7) respectively.

20. (a) Find the component statement of the following compound statement :

    (i) The sky is blue and the grass is green.

    (ii) It is raining and it is cold.   http://www.jkboseonline.com

    (b) Write the contrapositive of the following statement :

    (i) If a number is divisible by 9, then it is divisible by 3.

    (ii) If a triangle is equilateral, it is isosceles.

21. Three coins are tossed once. Find the probability of getting :

    (i) 3 heads

    (ii) 2 heads

    (iii) at least 2 heads

Or

One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely. Calculate the probability that the card will be a :

(i)   Diamond

(ii)   Not an ace

(iii)   Not a black card

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

Or

Find the term independent of x in the expansion of $\left| \dfrac{3}{2} x^2 - \dfrac{1}{3x} \right|^6$.

23. Write the relation $R = \{(x, x^3)\}$. x is a prime number less than 10 in roster form. Find the domain of R.

Or

A function f is defined by $f(x) = 2x - 5$. Write down the values of

(i) $f(0)$

(ii) $f(7)$

(iii) $f(-3)$

Section-D

(Long Answer Type Questions)

6 each

24. Find the general solution for the following equation :

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

Or

Prove that :

$$\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$$

25. Find the number of 8-letter arrangements that can be made from the letters of the word DAUGHTER so that :

(i) All vowels occur together

(ii) All vowels do not occur together

Or

What is the number of ways of choosing 4 cards from a pack of 52 playing cards ? In how many of these ?

(i) Four cards are of same suit

(ii) Four cards belong to four different suits

(iii) Cards are of same colour

26. Find the sum of the sequence 7, 77, 777, 7777, ... to *n* terms.

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Or

Insert 6 numbers between 3 and 24 such that the resulting sequence is an A.P.

27. Find the derivative of the function from first principle :

$$f(x) = \tan x$$

Or

Find the derivative of the following function using Rule method (quotient rule) :

$$f(x) = \frac{\sin x + \cos x}{\sin x - \cos x}$$

28. Find the equation of the ellipse with major axis along the x-axis and passing through the points (4, 3) and (−1, 4).

Or

Find the co-ordinates of the foci and the vertices, the eccentricity and the length of the latus-rectum of the hyperbola :

$$\frac{x^2}{16} - \frac{y^2}{9} = 1$$

29. Find the mean deviation about the mean for the following data :

x_i	2	5	6	8	10	12
f_i	2	8	10	7	8	5

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