



Roll No. ....

Total No. of Questions : 20 ]

[ Total No. of Printed Pages : 7

**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  $n$ th term is  $a_n = (n - 1)(n - 2)(n - 3)$  ?

2. Solve the inequality for real  $x$  :

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

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

- (A)  $\sec x$
- (B)  $\operatorname{cosec} x$
- (C)  $-\operatorname{cosec} x$
- (D) None of these

4. Define a simple event.

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**Turn Over**



**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  $\sin \frac{31\pi}{3}$ .
7. Find the multiplicative inverse of  $2 - 3i$ .
8. Evaluate :

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

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  $\frac{1}{2}$ .
12. How many terms of the A.P.  $-6, \frac{-11}{2}, -5, \dots$  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  $n \in \mathbb{N}$  :

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

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.
- (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

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

Or

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

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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**C-5-B**