MODEL TEST PAPER – II

Time : 3 hours **Maximum Marks : 100**

General Instructions :

(i) All questions are compulsory.

(ii) The question paper consists of 29 questions divided into three Sections A, B and C.

(iii) Section A comprises of 10 questions of one mark each. Section B comprises of 12 questions of four marks each and Section C comprises of 7 questions of six marks each.

(iv) There is no overall choice. However, an internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

SECTION A

1. Let A = {1, 2} and B = {3, 4}. Find the number of relations from A to B.

2. Find the value of sin 1845°.

3. Write the negation of the following statement : 'Sum of 2 and 3 is 6'.

4. Write the converse of the statement : 'If the sum of digits of a number is divisible by 9 then the number is divisible by 9'.

5. Write the solution of $3x^2 - 4x + \frac{20}{3} = 0$.

6. Find the sum of the series

   $(1^2 + 1) + (2^2 + 2) + (3^2 + 3) +$ .... to n terms.

7. A die is thrown. Find the probability of getting a number less than or equal to 6.

8. Five marbles are drawn from a bag which contains 7 blue marbles and 4 black marbles. What is the probability that all will be blue?

9. Find the general solution of $\cos 3\theta = -\frac{1}{2}$.

10. What is y-intercept of the line passing through the point (2, 2) and perpendicular to the line 3x + y = 3?

SECTION B

11. Evaluate : $\lim_{x \to 0} \frac{\tan x - \sin x}{x^3}$

OR

$\lim_{x \to 0} \frac{\cos ax - \cos bx}{x^2}$

12. Differentiate cot x with respect to x by the first principle.

13. Find the square root of –5 + 12 i

14. How many diagonals are there in a polygon with n sides?

15. Prove the following by the principle of mathematical induction

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + ... + \frac{1}{n(n+1)} = \frac{n}{n+1}, \; n \in N$$

OR

Using principle of mathematical induction prove that

$4^n + 15n - 1$ is divisible by 9 for all $n \in N$.

16. Find the domain and range of $f(x) = \frac{1}{\sqrt{x-5}}$

17. Find the value of n so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be the geometric mean between a and b.

OR

Find the sum of the following series upto n terms :

.6 + .66 + .666 + ...

18. If p is the length of perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

19. Find the length of the axes, eccentricity and length of the latus-rectum of the hyperbola $25x^2 - 36y^2 = 225$.

OR

Find the equation of the circle passing through the point of intersection of the lines $x + 3y = 0$ and $2x - 7y = 0$ and whose centre is the point of intersection of the lines $x + y + 1 = 0$ and $x - 2y + 4 = 0$.

20. Using section formula, prove that the three points (–4, 6, 10), (2, 4, 6) and (14, 0, –2) are collinear.

21. On her vacations Veena visits four cities (A, B, C, D) in a random order. What is the probability that she visits.

(i) A before B? (ii) A before B and B before C?

22. Prove that

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

SECTION C

23. In a survey of 100 persons it was found that 28 read magazine A, 30 read magazine B, 42 read magazine C, 8 read magazines A and B, 10 read magazines A and C, 5 read magazines B and C and 3 read all the three magazines. Find :

(i) How many read none of the three magazines?

(ii) How many read magazine C only?

24. The 3^{rd}, 4^{th} and 5^{th} terms in the expansion of $(x + a)^n$ are respectively 84, 280 and 560, find the values of x, a and n.

OR

The coefficients of $(r - 1)^{th}$, r^{th} and $(r + 1)^{th}$ terms in the expansion of $(x + 1)^n$ are in the ratio 1 : 3 : 5. Find n and r.

25. Find the sum of the following series upto n terms :

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + ...$$

26. Prove that

$$\cos 20° \cos 40° \cos 60° \cos 80° = \frac{1}{16}$$

27. Solve the following system of inequalities graphically :

$$x + 2y \leq 10,\ x + y \geq 1,\ x - y \leq 0,\ x \geq 0,\ y \geq 0.$$

28. Find the general solution of

$$\cos\theta \cos 2\theta \cos 3\theta = \frac{1}{4}$$

OR

If $\tan x = \frac{3}{4}, \pi < x < \frac{3\pi}{2}$, find $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$

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

Marks	0–10	10–20	20–30	30–40	40–50	50–60
Number of girls	8	10	10	16	4	2

ANSWERS

1. 16
2. $\frac{1}{\sqrt{2}}$
3. It is false that sum of 2 and 3 is 6.
4. If a number is divisible by 9 then the sum of the digits of the number is divisible by 9.
5. $\frac{2 \pm 4i}{3}$
6. $\frac{n(n+1)(2n+1)}{6} + \frac{n(n+1)}{2}$
7. 1
8. $\frac{1}{22}$

9. $\frac{2n\pi}{3} \pm \frac{2\pi}{9}$, $n \in z$.

10. $\frac{4}{3}$

11. $\frac{1}{2}$ or $\frac{b^2 - a^2}{2}$

12. $-\text{cosec}^2 x$

13. $\pm (2 + 3i)$

14. $\frac{n(n-3)}{2}$

16. $(5, \infty)$; $(0, \infty)$

17. $n = -\frac{1}{2}$ or $\frac{2n}{3} - \frac{2}{27}\left(1 - 10^{-n}\right)$

19. Length of transverse axis = 6, lengths of conjugate axis = 5, $e = \frac{\sqrt{61}}{6}$,

Length of latus rectum $= \frac{25}{6}$

OR $x^2 + y^2 + 4x - 2y = 0$.

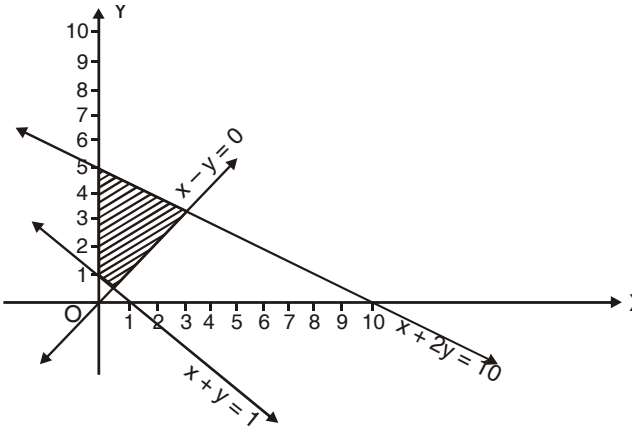
21. (i) $\frac{1}{2}$ (ii) $\frac{1}{6}$

23. (i) 20 (ii) 30

24. $n = 7$, $a = 2$, $x = 1$ **OR** $n = 7$ and $r = 3$.

25. $\frac{n}{24}\left(2n^2 + 9n + 13\right)$

27.



28. $\theta = (2n + 1)\frac{\pi}{8}$, $n\pi \pm \frac{\pi}{3}$, $n \in z$ or $\frac{3}{\sqrt{10}}, \frac{1}{\sqrt{10}}$, 3.

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