

MODEL TEST PAPER-II**Time: 3 hours****Maximum Marks: 100****General Instructions:**

- (i) All questions are compulsory.
- (ii) The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, section B comprises of 13 questions of 4 marks each and section C comprises of 7 questions of six marks each.
- (iii) All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- (iv) There is no overall choice. However 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.
- (v) Use of calculator is not permitted.

SECTION A

- 1. What is the eccentricity of the hyperbola $9y^2 - 4x^2 = 36$
- 2. Write the domain of the function, $f(x) = \frac{x}{x^2 - 5x + 6}$
- 3. Write the slope and y intercept of the line $5x + 7y = 28$
- 4. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?
- 5. Write the argument of $2i$.
- 6. If ${}^{n+1}C_2 = 45$, find n.

SECTION-B

7. If $x + y = \frac{\pi}{4}$, Prove that $(1 + \tan x)(1 + \tan y) = 2$

OR

Find the general solution of the equation $\sqrt{3} \cos \theta + \sin \theta = \sqrt{2}$

8. Let $x = 1 + a + a^2 + \dots \infty$ and $y = 1 + b + b^2 + \dots \infty$ where $|a| < 1$; $|b| < 1$

Prove that: $1 + ab + a^2b^2 + \dots = \frac{xy}{x + y - 1}$

9. If A and B are two sets such that

$$n(A - B) = 14 + x, \quad n(B - A) = 3x \text{ and } n(A \cap B) = x$$

Draw a Venn diagram to illustrate information and if $n(A) = n(B)$ then find the value of x

10. Find the derivative of $\sec(2x - 3)$ from first principle

OR

Evaluate: $\lim_{x \rightarrow 2} \frac{x^3 - 6x^2 + 11x - 6}{x^2 - 6x + 8}$

11. A Polygon has 25 sides, the length of which starting from the smallest side are in Arithmetical Progression. If the perimeter of the polygon is 2100 cm and the length of the largest side is 20 times that of the smallest side. Find the length of smallest side and common difference of AP.

12. Find the domain of the real function $f(x)$ defined by

$$f(x) = \sqrt{\frac{1 - |x|}{2 - |x|}}$$

13. If z is complex number such that $|z|=1$. Prove that $\frac{z-1}{z+1}$ is purely imaginary. What will be your conclusion if $z=1$?

OR

Find the square root of $7+24i$.

14. How many four digit numbers divisible by 4 can be made with the digits 1, 2, 3, 4, 5. If the repetition of digit is not allowed?
15. Find the coordinate of a point equidistant from the four points O (0,0,0), A(a,0,0), B (0, b,0), C (0,0, c).
16. Write the component statement of each of the following statements. Also, check whether the statements are true or not.
- (i) If a triangle ABC is equilateral, then it is isosceles.
- (ii) If a and b are integers, then ab is rational number.
17. Find the coefficient of x^5 in the expansion of $(1+x)^{21} + (1+x)^{22} + \dots + (1+x)^{30}$

OR

Find the value of x if the middle term of $\left(\frac{1}{x} + x \sin x\right)^{10}$ is $7\frac{7}{8}$.

18. A young man visits a hospital for medical check-up. The probability that he has lung problem is 0.45, heart problem is 0.29 and either lung or heart problem is 0.47. What is the probability that he has both type of problems: lungs as well as heart? Out of 1000 persons, how many are expected to have both type of problem What should be done to keep good health and hospital away? Describe briefly.
19. A circle of radius 5 units touches the coordinate axes in first quadrant. If the circle makes one complete roll on x axis along positive direction of x axis. Find its equation in new position?

OR

Find the equation of circle concentric with circle $2x^2 + 2y^2 - 6x + 8y + 1 = 0$ and double its area.

SECTION-C

20. Find the equation of circle which touches the lines $4x - 3y + 10 = 0$ and $4x - 3y - 30 = 0$ and whose centre lies on the line $2x + y = 0$.
21. If p, q, r are in G.P and the equations $px^2 + qx + r = 0$ and $dx^2 + 2ex + f = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P.
22. Show that: $\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ = 4$

OR

If $\cos(A+B)\sin(C-D) = \cos(A-B)\sin(C+D)$ then show that $\tan A \tan B \tan C + \tan D = 0$.

23. The mean and standard deviation of a group of 100 observations were found to be 20 and 3 respectively. Later on it was found that three observations were incorrect, which were recorded as 21, 21 and 18. Find the mean standard deviation if the incorrect observation are omitted.
24. Solve the following system of inequalities graphically
 $x - 2y \leq 3$; $3x + 4y \geq 12$; $x \geq 0$; $y \geq 1$
25. Prove by the principle of mathematical induction that $\frac{n^5}{5} + \frac{n^3}{3} + \frac{7n}{15}$ is a natural number for all $n \in N$.

26. The hypotenuse of a right isosceles triangle has its ends at the points (1,3) and (-4,1). Find the equations of the legs (perpendicular) sides of the triangle.

OR

Find the centroid, circumcentre and orthocentre of the triangle whose sides have the following equations:

$$3x - 4y = 0 ; 12y + 5x = 0 ; y - 15 = 0 .$$

ANSWERS

1. $\frac{\sqrt{13}}{2}$
2. $R - \{2,3\}$
3. $\text{slope} = \frac{-5}{7}, y - \text{intercept} = 4$
4. 12π
5. $\frac{\pi}{2}$
6. $n = 9$
7. $\theta = 2n\pi + \frac{5\pi}{12}$ or $\theta = 2n\pi - \frac{\pi}{12}$ where $n \in \mathbb{Z}$
9. $x = 7$
10. $2\sec(2x-3)\tan(2x-3)$ or $\frac{1}{2}$
11. smallest side of polygon is 8cm ; $d = \frac{19}{3}\text{cm}$
12. $D = (-\infty - 2) \cup (2, \infty) \cup [-1, 1]$
13. $\frac{z-1}{z+1} = 0$ which is purely real or $\pm(4+3i)$
14. 24
15. $\left(\frac{a}{2}, \frac{b}{2}, \frac{c}{2}\right)$

17. ${}^{31}C_6 - {}^{21}C_6$ or $x = n\pi + (-1)^n \frac{\pi}{6}; n \in Z$

18. 270 persons

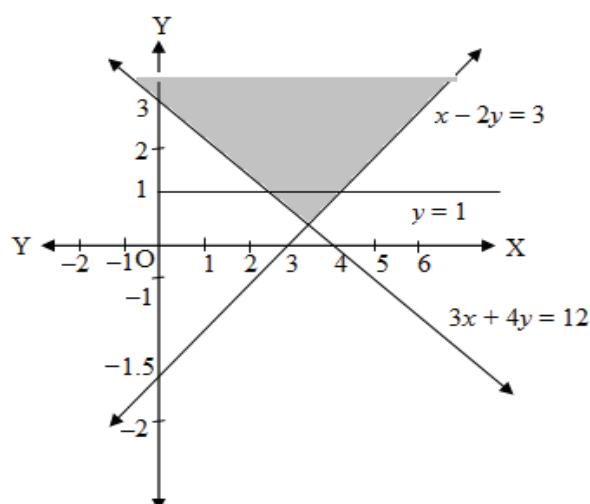
19. $[x - (5 + 10\pi)]^2 + (y - 5)^2 = 5^2$

$$4x^2 + 4y^2 - 12x + 16y - 21 = 0$$

21. $(x - 1)^2 + (y + 2)^2 = 16$

23. correct mean = 20, correct S.D = 3.036

24.



26. $7x - 3y + 2 = 0$ centroid $\left(-\frac{16}{3}, 10\right)$
 $3x + 7y + 5 = 0$ OR circumcentre $\left(-8, \frac{63}{2}\right)$
 $7x - 3y + 31 = 0$ orthocentre $(0, -33)$
 $3x + 7y + 5 = 0$