#### XII-FP1-24

### **Full Portion Test - 1**

# Standard XII MATHEMATICS

Time: 3.00 hrs. Marks: 90

Instructions: 1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

2) Use Blue or Black ink to write.

PART-I 20x1=20

d) 2

Note:i) Answer all the questions.

ii) Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.

1. If  $|\operatorname{adj}(\operatorname{adj} A)| = |A|^9$ , then the order of the square matrix A is

a) 3

b) 4

c) 2

d) 5

2. If  $A^T A^{-1}$  is symmetric, then  $A^2 =$ a)  $A^{-1}$ b)  $(A^T)^2$ c)  $A^T$ d)  $(A^{-1})^2$ 

3. The area of the triangle formed by the complex numbers z, iz and z + iz in the Argand's diagram is

(a) 
$$\frac{1}{2}|z|^2$$
 (b)  $|z|^2$  (c)  $\frac{3}{2}|z|^2$  (d)  $2|z|^2$ 

(5. If 
$$\alpha, \beta$$
 and  $\gamma$  are the zeros of  $x^3 + px^2 + qx + r$ , then  $\sum \frac{1}{\alpha}$  is

(a)  $-\frac{q}{r}$ 

(b)  $-\frac{p}{r}$ 

(c)  $\frac{q}{r}$ 

(d)  $-\frac{q}{p}$ 

6. The polynomial  $x^3 - kx^2 + 9x$  has three real zeros if and only if, k satisfies

a) 
$$|\mathbf{k}| \le 6$$
 b)  $|\mathbf{k}| = 0$  c)  $|\mathbf{k}| > 6$  d)  $|\mathbf{k}| \ge 6$ 

7. If  $\cot^{-1} x = \frac{2\pi}{5}$  for some  $x \in \mathbb{R}$ , the value of  $\tan^{-1} x$  is

a) 
$$-\frac{\pi}{10}$$
 b)  $\frac{\pi}{5}$  c)  $\frac{\pi}{10}$  d)  $-\frac{\pi}{5}$ 

8. If cot<sup>-1</sup> 2 and cot<sup>-1</sup> 3 are two angles of a triangle, then the third angle is

9. The radius of the circle  $3x^2 + by^2 + 4bx - 6by + b^2 = 0$  is

a) 1 b) 3 c) 
$$\sqrt{10}$$
 d)  $\sqrt{11}$ 

10. The eccentricity of the ellipse  $(x-3)^2 + (y-4)^2 = \frac{y^2}{9}$  is

a) 
$$\frac{\sqrt{3}}{2}$$
 b)  $\frac{1}{3}$  c)  $\frac{1}{3\sqrt{2}}$  d)  $\frac{1}{\sqrt{3}}$ 

#### XII-FP1-24

11. If  $\vec{a}$  and  $\vec{b}$  are unit vectors such that  $[\vec{a}, \vec{b}, \vec{a} \times \vec{b}] = \frac{1}{4}$ , then the angle between  $\vec{a}$  and  $\vec{b}$  is

a)  $\frac{\pi}{6}$ 

b)  $\frac{\pi}{4}$ 

c)  $\frac{\pi}{2}$ 

12. If the length of the perpendicular from the origin to the plane  $2x + 3y + \lambda z = 1$ ,  $\lambda > 0$  is  $\frac{1}{5}$ , then the value of \(\lambda\) is

- a) 2\square
- b)  $3\sqrt{2}$
- c) 0

d) 1

13. The tangent to the curve  $y^2 - xy + 9 = 0$  is vertical when

- a) y = 0
- b)  $y = \pm \sqrt{3}$

14. The minimum value of the function |3-x|+9 is

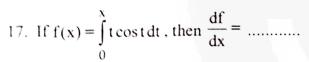
15. If  $v(x, y) = \log(e^x + e^y)$ , then  $\frac{\partial v}{\partial x} + \frac{\partial v}{\partial y}$  is equal to

- a)  $e^x + e^y$
- (b)  $\frac{1}{e^{x} + e^{y}}$



16. If  $f(x) = \frac{x}{x+1}$ , then its differential is given by

- a)  $\frac{-1}{(x+1)^2} dx$
- (b)  $\frac{1}{(x+1)^2} dx$  (c)  $\frac{1}{x+1} dx$
- $\frac{1}{x+1}dx$



- a)  $\cos x x \sin x$
- b)  $\sin x + x \cos x$
- c) x cos x
- d) x sin x

18. The order and degree of  $\left(\frac{d^2y}{dx^2}\right)^3 = \sqrt{1 + \frac{dy}{dx}}$ 

- a) 6, 2
- b) 2, 6
- c) 2, 3

d) 3, 2

19. A random variable X has binomial distribution with n = 25 and p = 0.8 then standard deviation of X is

c) 3

\_d) 2

20. The proposition  $p \wedge (\neg p \vee q)$  is

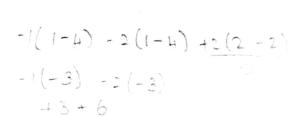
a) a tautology

- b) a contradiction
- c) logically equivalent to p \ q
- d) logically equivalent to  $p \lor q$

PART-II

Note: i) Answer any seven questions. ii) Question no.30 is compulsory.



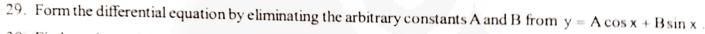


#### XII-FP1-24

3

5

- 22. If  $z_1 = 2 i$  and  $z_2 = -4 + 3i$ , find the inverse of  $z_1 z_2$  and  $\frac{z_1}{z_2}$
- 23. Find the principal value of  $\cos^{-1}\left(\frac{1}{2}\right)$ .
- 24. The line 3x + 4y 12 = 0 meets the coordinate axes at A and B. Find the equation of the circle drawn on AB as diameter.
- 25. Find the distance of a point (2,5,-3) from the plane  $\vec{r} \cdot (6\hat{i} 3\hat{j} + 2\hat{k}) = 5$ .
- 26. Evaluate:  $\lim_{x \to 0} \frac{1 \cos x}{x^2}$
- 27. Find df for  $f(x) = x^2 + 3x$  and evaluate it for x = 2 and dx = 0.1.
- 28. If  $\int_{0}^{\infty} e^{-\alpha x^{2}} x^{3} dx = 32$ ,  $\alpha > 0$ , find  $\alpha$ .



30. Find a polynomial equation of minimum degree with rational coefficients, having  $2 + \sqrt{3}i$  as a root.

#### PART-III

Note: i) Answer any seven questions.

ii) Question no. 40 is compulsory.

7x3=21

- 31. Show that the equation  $z^2 = \overline{z}$  has four solutions.
- 32. If  $\alpha, \beta$  and  $\gamma$  are the roots of the polynomial equation  $ax^3 + bx^2 + cx + d = 0$ , find the value of in terms of  $\Sigma \frac{\alpha}{\beta \gamma}$  the coefficients.
- 33. Find the domain of  $\sin^{-1}(2-3x^2)$ .
- 34. Find the equations of the two tangents that can be drawn from (5, 2) to the ellipse  $2x^2 + 7y^2 = 14$ .
- 35. Show that the four points (6,-7,0), (16,-19,-4), (0,3,-6), (2,-5,10) lie on a same plane.
- 36. Compute the value of 'c' satisfied by Rolle's theorem for the function  $f(x) = \log\left(\frac{x^2 + 6}{5x}\right)$  in the interval [2,3].
- 37. If  $U(x,y,z) = \log(x^3 + y^3 + z^3)$ , find  $\frac{\partial U}{\partial x} + \frac{\partial U}{\partial y} + \frac{\partial U}{\partial z}$ .
- 38. Evaluate:  $\int_{2}^{3} \frac{\sqrt{x}}{\sqrt{5-x} + \sqrt{x}} dx$
- 39. Solve:  $\frac{dy}{dx} = \tan^2(x+y)$ 
  - 46. Three fair coins are tossed simultaneously. Find the probability mass function for number of heads occurred.

#### XII-FP1-24

## PART-IN

7x5 = 35

Note: Answer all the questions.

41. a) Solve the following system of linear equations by matrix inversion method.

Solve the following system of 
$$x + y + z - 2 = 0$$
,  $6x - 4y + 5z - 31 = 0$ ,  $5x + 2y + 2z = 13$ 
(OR)

b) By using Gaussian elimination method, balance the chemical reaction equations:

$$C_2H_6 + O_2 \rightarrow H_2O + CO_2$$

42. a) If z = x + iy is a complex number such that  $Im\left(\frac{2z+1}{iz+1}\right) = 0$ , show that the locus of z is  $2x^2 + 2v^2 + x - 2v = 0$ 

b) Solve the following equation:  $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$ 

43. a) If  $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi$  and 0 < x, y, z < 1, show that  $x^2 + y^2 + z^2 + 2xyz = 1$ .

b) Identify the type of conic and find centre, foci, vertices and directrices of the following.  $18x^2 + 12y^2 - 144x + 48y + 120 = 0.$ 

44. a) Find the parametric form of vector equation, and Cartesian equations of the plane containing the line  $\vec{r} = (\hat{i} - \hat{j} + 3\hat{k}) + t(2\hat{i} - \hat{j} + 4\hat{k})$  and perpendicular to plane  $\vec{r} \cdot (\hat{i} + 2\hat{j} + \hat{k}) = 8$ 

(b) Expand tan x in ascending powers of x upto 5th power for  $-\frac{\pi}{2} < x < \frac{\pi}{2}$ .

45. a) If 
$$U = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$$
, show that  $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$ .

(OR)

b) Evaluate the integral using properties of integration:  $\int_{-1}^{\infty} \frac{1}{1 + \sqrt{\tan x}} dx$ 

46. a) Find the area of the region bounded between the curves  $y = \sin x$  and  $y = \cos x$  and the lines x=0 and  $x=\pi$ .

(OR)

(b) Solve: 
$$(1+x^3)\frac{dy}{dx} + 6x^2y = 1+x^2$$

47. a) A random variable X has the following probability mass function.

The same of the same of	x	1	2	3	4	5
and the state of t	f(x)	$\mathbf{k}^2$	$2k^2$	$3k^2$	2k	3k

Find (i) the value of k (ii)  $P(2 \le X < 5)$  (iii) P(3 < X)

by Using truth table check whether the statements  $\neg (p \lor q) \lor (\neg p \land q)$  and  $\neg p$  are logically equivalent.