

## FIRST REVISION TEST - Jan. 2023

11 - Std

Time - 3.00 Hours

## MATHEMATICS

Reg.No

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Marks : 90

## PART - I

Note : i) Answer all the questions. ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer 20 X 1 = 20

- The total number of relations on a set containing 3 elements is  
a) 9                                      b) 81                                      c) 512                                      d) 1024
- Let  $x = \{1, 2, 3, 4\}$  and  $R = \{(1,1), (1,2), (1,3), (2,2), (3,3), (2,2), (3,3), (2,1), (3,1), (1,4), (4,1)\}$  Then R is  
a) reflexive                                      b) symmetric                                      c) transitive                                      d) equivalence
- If 3 is the logarithm of 343, then the base is  
a) 5                                      b) 7                                      c) 6                                      d) 9
- If  $\frac{kx}{(x+2)(x-1)} = \frac{2}{x+2} + \frac{1}{x-1}$ , then the value of k is  
a) 1                                      b) 2                                      c) 3                                      d) 4
- Which of the following is not true?  
a)  $\sin\theta = \frac{-3}{4}$                                       b)  $\cos\theta = -1$                                       c)  $\tan\theta = 25$                                       d)  $\sec\theta = \frac{1}{4}$
- In a triangle ABC,  $\sin^2 A + \sin^2 B + \sin^2 C = 2$  then the triangle is  
a) equilateral triangle                                      b) isosceles triangle                                      c) right triangle                                      d) Scalene triangle
- There are 10 points in a plane and 4 of them are collinear. The number of straight lines joining any two points is  
a) 45                                      b) 40                                      c) 39                                      d) 38
- Number of sides of a polygon having 44 diagonals is .....  
a) 4                                      b) 4!                                      c) 11                                      d) 22
- The HM of two positive numbers whose AM and GM are 16, 8 respectively is  
a) 10                                      b) 6                                      c) 5                                      d) 4
- The image of the point (2,3) in the line  $y = -x$  is  
a) (-3, -2)                                      b) (-3,2)                                      c) (-2, -3)                                      d) (3,2)
- If  $A = \begin{bmatrix} a & x \\ y & a \end{bmatrix}$  and if  $xy = 1$  then  $\det(AA^T)$  is equal to  
a)  $(a-1)^2$                                       b)  $(a^2+1)^2$                                       c)  $a^2 - 1$                                       d)  $(a^2 - 1)^2$
- If  $\lambda \vec{i} + 2\lambda \vec{j} + 2\lambda \vec{k}$  is a unit vector then the value of  $\lambda$  is  
a)  $\frac{1}{3}$                                       b)  $\frac{1}{4}$                                       c)  $\frac{1}{9}$                                       d)  $\frac{1}{2}$
- If  $\lim_{x \rightarrow 0} \frac{\sin px}{\tan 3\theta} = 4$  then the value of  $p$  is  
a) 6                                      b) 9                                      c) 12                                      d) 4

14. If  $f(x) = x \tan^{-1} x$ , then  $f'(1)$  is

- a)  $1 + \frac{\pi}{4}$       b)  $\frac{1}{2} + \frac{\pi}{4}$       c)  $\frac{1}{2} - \frac{\pi}{4}$       d) 2

15.  $\int \frac{\sec x}{\sqrt{\cos 2x}} dx$  is

- a)  $\tan^{-1}(\sin x) + c$       b)  $2\sin^{-1}(\tan x) + c$       c)  $\tan^{-1}(\cos x) + c$       d)  $\sin^{-1}(\tan x) + c$

16. A number is selected from the set  $\{1, 2, 3, \dots, 20\}$ . The probability that the selected number is divisible by 3 or 4 is

- a)  $\frac{2}{5}$       b)  $\frac{1}{8}$       c)  $\frac{1}{2}$       d)  $\frac{2}{3}$

17. Suppose a fair die is rolled. Find the probability of getting an even number is

- a)  $\frac{1}{3}$       b)  $\frac{1}{2}$       c)  $\frac{1}{4}$       d) 1

18.  $\int \frac{1}{1+x^2} dx$  is

- a)  $\sin^{-1} x + c$       b)  $\cos^{-1} x + c$       c)  $\tan^{-1} x + c$       d)  $\cot^{-1} x + c$

19. Find the value of  $\lambda$  for which the vectors  $\vec{a}$  and  $\vec{b}$  are perpendicular, where

$$\vec{a} = z\vec{i} + \lambda\vec{j} + \vec{k} \text{ and } \vec{b} = \vec{i} - 2\vec{j} + 3\vec{k} \text{ is}$$

- a)  $\lambda = \frac{5}{2}$       b)  $\lambda = \frac{3}{2}$       c)  $\lambda = \frac{-5}{2}$       d)  $\lambda = \frac{-3}{2}$

20. The principle solution of  $\sin \theta = \frac{\sqrt{3}}{2}$  is

- a)  $\theta = \frac{\pi}{3}$       b)  $\theta = \frac{\pi}{6}$       c)  $\theta = \frac{\pi}{3}$       d)  $\theta = \frac{\pi}{6}$

### PART - III

Note : Answer any seven. Q.No.30 is compulsory

7 X 2 = 14

21. For a set A,  $A \times A$ , contains 16 elements and two of its elements are (1,3) and (0,2) find the elements of A.

22. If a and b are the roots of the equation  $x^2 - kx + m = 0$ , find the value of  $\frac{2}{a} + \frac{2}{b}$

23. show that  $\sin^2 \frac{\pi}{18} + \sin^2 \frac{\pi}{9} + \sin^2 \frac{7\pi}{18} + \sin^2 \frac{4\pi}{9} = 2$

24. If  $\frac{1}{7!} + \frac{1}{8!} = \frac{A}{9!}$  the find the value of A.

25. Find the combined equation of the straight lines whose separate equations are  $x - 2y - 3 = 0$  and  $x + y + 5 = 0$ .

26. Find  $|A|$ , If  $A = \begin{bmatrix} 0 & \sin \alpha & \cos \alpha \\ \sin \alpha & 0 & \sin \beta \\ \cos \alpha & -\sin \beta & 0 \end{bmatrix}$

27. Find :  $\frac{dy}{dx}$  If  $x = at^2, y = zat, t \neq 0$

28. Evaluate :  $\int \frac{\sin x}{\cos^2} dx$

29. If A and B are mutually exclusive events.  $P(A) = \frac{3}{8}$  and  $P(B) = \frac{1}{8}$  then find  $P(A \cup B)$

30. Find the area of the parallelogram whose adjacent sides are  $\vec{a} = 3\vec{i} - 2\vec{j} + \vec{k}$  and  $\vec{b} = \vec{i} - 2\vec{j} + 3\vec{k}$

**PART - III**

Note : Answer any seven questions. Question No. 40 is compulsory.

7 X 3 = 21

31. Draw the graph of (i)  $y = x^3$  (ii)  $y = -x^3$

32. Prove  $\log a + \log a^2 + \log a^3 + \dots + \log a^n = \frac{n(n+1)}{2} \log a$

33. Find the value of  $\cos 105^\circ$

34. Find the number of ways of arranging the letters of the word MATHEMATICS.

35. Find the expansion of  $(2x+3)^5$

36. Show that  $\begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}^2 = \begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{vmatrix}$

37. Find the vectors of magnitude 6 which are perpendicular to both vectors  $\vec{a} = 4\vec{i} - \vec{j} + 3\vec{k}$  and  $\vec{b} = -2\vec{i} + \vec{j} - 2\vec{k}$

38. Find  $\frac{d^2y}{dx^2}$ , if  $x^2 + y^2 = 4$

39. Compute  $\lim_{x \rightarrow 1} \frac{x^3 - 1}{x - 1}$

40. Find the equation of a perpendicular line passing through the point (1,2) to the line  $3x + 4y = 7$

**PART - IV**

Note : Answer all the questions.

7 X 5 = 35

41. a) If  $f: \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 2x - 3$  prove that f is a bijection and find its inverse.  
(or)

b) By the principle of mathematical induction, prove that for  $n \geq 1$ .

$$1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$$

42. a) Resolve into partial fractions  $\frac{x+12}{(x+1)^2(x-2)}$  (or)
- b) If  $A+B+C=180^\circ$  prove that  $\sin^2A + \sin^2B + \sin^2C = 4 \sin A \sin B \sin C$ .
43. a) If  $A+B=45^\circ$ , show that  $(1+\tan A)(1+\tan B)=2$  (or)
- b) If  $a^2+b^2=7ab$ , show that  $\log \frac{a+b}{3} = \frac{1}{2}(\log a + \log b)$
44. a) Prove that  $\sqrt[3]{x^3+7} - \sqrt[3]{x^3+4}$  is approximately equal to  $\frac{1}{x^2}$  when 'x' is large  
(or)
- b) Prove that  $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$
45. (a) Show that the equation  $9x^2 + 24xy + 16y^2 - 12x + 16y - 12 = 0$  represents a pair of parallel lines. Find the distance between them. (or)
- (b) There are two identical urns containing respectively 6 black and 4 red balls; 2 black and 2 red balls. An urn is chosen at random and a ball is drawn from it. (i) find the from the first urn?
46. a) Prove that  $\begin{vmatrix} 1 & x^2 & x^3 \\ 1 & y^2 & y^3 \\ 1 & z^2 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$  (or)
- b) If  $y = \frac{\sin^{-1}x}{\sqrt{1-x^2}}$ , show that  $(i-x^2)y_2 - 3xy_1 - y = 0$
47. a) Evaluate  $\int \frac{3x+5}{x^2+4x+7} dx$  (or)
- b) Show that the points whose position vectors  $4\vec{i} + 5\vec{j} + \vec{k}, -\vec{j} - \vec{k}, 3\vec{i} + 9\vec{j} + 4\vec{k}$  and  $4\vec{i} + 4\vec{j} + 4\vec{k}$ , are coplanar.

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