No. of printed pages: 4

M101920

Register Number:

# AIM ACTIVATION EXAM

MODEL PUBLIC EXAM (15th year )

## MATHEMATICS

**Time Allowed: 3.00 hrs]** **[Maximum Marks: 100**

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

2. Use Black or Blue ink to write and underline use pencil to draw diagrams.

**Note:** This question paper contains four parts.

## PART – I

***NOTE:*** *I) Answer all the 14 questions.*

*II) Choose and write the correct answer from the given four alternatives and write the option code with the corresponding answer.* *14 x 1 = 14*

1. Let $f(x) = \sqrt{1 + x^3}$ then

a) $f(xy) = f(x)\,f(y)$ b) $f(xy) \geq f(x)\,f(y)$ c) $f(xy) \leq f(x)\,f(y)$ d) none of these

2. Composition of function is associative

a) Always true b) Never true c) Some times true d) None of these

3. The number of divisors of any prime number is _____

a) one b) two c) three d) four

4. If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \ldots\ldots + 2^{0}$ which of the following is true?

a) B is $2^{64}$ more than A b) A and B are equal

c) B is larger than A by 1 d) A is larger than B by 1

[Turn over

5. For a system of linear equations in three variables the minimum number of equations required to get unique solution is

a) one b) two c) three d) four

6. Which one of the following should be added to make $x^4 + 64$ a perfect square

a) $4x^2$ b) $16x^2$ c) $8x^2$ d) $-8x^2$

7. Graph of linear polynomial is a _____

a) Straight line b) Circle c) Parabola d) Hyperbola

8. The first theorem in mathematics is _____

a) Thales theorem b) Angle Bisector theorem

c) Pythagoras theorem d) Alternate segment theorem

9. The inclination of Y axis and every line parallel to Y axis is

a) $0^0$ b) $90^0$ c) $60^0$ d) $45^0$

10. $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \operatorname{cosec}\theta)$ is equal to

a) 0 b) 1 c) 2 d) -1

11. The difference between the C.S.A and T.S.A of a cone is

a) $2\pi r$ b) $\pi r^2$ c) $\pi rl$ d) $\pi r^2 h$

12. The range of first 10 prime number is

a) 27 b) 10 c) 25 d) 22

13. If A and B are mutually exclusive events then $P(A \cap B) =$

a) 0 b) 1 c) 2 d) 3

14. Which of the following is incorrect?

a) $P(A) > 1$ b) $0 \le P(A) \le 1$ c) $P(\varphi) = 0$ d) $P(A) + P(\bar{A}) = 1$

## PART – II

Note: Answer any TEN of the following in which Q.No.28 is compulsory . $10 \times 2 = 20$

15. Define Pre – image.

16. If $f(x) = 3x - 2$, $g(x) = 2x + k$ and if $fog = gof$, then find the value of k.

17. Solve $3x - 2 \equiv 0 \pmod{11}$

18. Find the 8th term of the G.P 9, 3, 1, ____

19. Simplify: $\frac{5t^3}{4t-8} \times \frac{6t-2}{10t}$

20. Solve : $x^2 - 3x - 2$ ( using perfect square)

21. If $A = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ prove that $AA^T = I$.

22. Write down any five Pythagorean triplets?

23. In $\Delta ABC$, D and E are points on the sides AB and AC respectively such that DE || BC

If $\frac{AD}{DB} = \frac{3}{4}$ and AC = 15cm find AE.

24. If the straight line $12y = -(p+3)x + 12$, $12x - 7y = 16$ are perpendicular then find 'p'.

25. Find the angle of elevation of the top of a tower from a point on the ground, which is 30m away from the foot of a tower of height $10\sqrt{3}$ m.

26. Find the diameter of a sphere whose surface area is 154 $m^2$.

27. If the range and the smallest value of a set data are 36.8 and 13.4 respectively, then find the largest value.

28. If $1 + 2 + 3 + \ldots\ldots + n = 666$ then find n.

## PART - III

Note: Answer any TEN of the following in which Q.No.42 is compulsory. $10 \times 5 = 50$

29. Let $A = \{x \in W / x < 2\}$, $B = \{x \in N / 1 < x \leq 4\}$ and $C = (3, 5)$ verify that

$A \times (B \cup C) = (A \times B) \cup (A \times C)$

30. If the function $f: R \to R$ is defined by $f(x) = \begin{cases} 2x + 7, & x < -2 \\ x^2 - 2, & -2 \leq x < 3 \\ 3x - 2, & x \geq 3 \end{cases}$ then find the value

of i) $f(4) + 2f(1)$ ii) $\frac{f(1) - 3f(4)}{f(-3)}$

31. The sum of three consecutive terms that are in A.P is 27 and their product is 288. Find the three terms.

32. Find the sum of the geometric series $3 + 6 + 12 + \ldots\ldots + 1536$.

33. Find the G.C.D of $3x^3 + 3x^2 + 3x + 3$, $6x^3 + 12x^2 + 6x + 12$.

34. The hypotenuse of a right angled triangle is 25cm and its perimeter 56cm. Find the length of the smallest side.

[Turn over

35. State and prove that Alternate segment theorem.

36. A line makes positive intercepts on coordinate axes whose sum is 7 and its passes through (–3, 8 ). Find its equation.

37. An Aeroplane at an altitude of 1000m finds that two boats are sailing towards it in the same direction. The angles of depression of the boats as observed from the aeroplane from the aeroplane are 60° and 30° respectively. Find the distance between the two boats ( $\sqrt{3} = 1.732$ )

38. The volumes of two cones of same base radius are 3600cm³ and 5040 cm³. Find the ratio of heights.

39. The volume of a cone is $1005\frac{5}{7}$ cu.cm. The area of its base is $201\frac{1}{7}$ sq. cm. Find the slant height of the cone.

40. Find the mean and variance of the first n natural numbers.

41. Two dice are rolled together. Find the probability of getting a doublet or sum of faces as 4.

42. If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + b^2 - ac = 0$ are real and equal prove that either $a = 0$ (or) $a^3 + b^3 + c^3 = 3abc$.

## PART – IV

Note: Answer all the questions. 2 x 8 = 16

43. a) Construct a triangles similar to a given triangle PQR with its sides equal to $\frac{7}{3}$ of the corresponding sides of the triangle PQR.

(Or)

b) Construct a ΔPQR in which PQ = 8cm, R = ∠60° and the median RG from R to PQ is 5.8 cm. Find the length of the altitude from R to PQ.

44. a) Draw the graph of $y = (x - 1)(x + 3)$ and hence solve $x^2 - x - 6 = 0$.

(Or)

b) If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, show that $A^2 - 5A + 7I_2 = 0$.