Standard 10

Time: 3.00 Hours

MATHEMATICS

Part - I

Marks: 100

Answer all the questions.   14×1=14

1) If g={(1,1), (2, 3), (3, 5), (4, 7)} is a function given by g(x) = αx + β, then the values of α and β are

   a) (−1, 2)   b) (2, −1)   c) (−1, −2)   d) (1, 2)

2) If f(x) = 2x² and g(x) = $\frac{1}{3x}$ then fog is

   a) $\frac{3}{2x^2}$ b) $\frac{2}{3x^2}$ c) $\frac{2}{9x^2}$ d) $\frac{1}{6x^2}$

3) Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is

   a) 3   b) 5   c) 8   d) 11

4) If A = 2^{65} and B = $2^{64} + 2^{63} + 2^{62} + \ldots + 2^0$ 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

5) $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is

   a) $\frac{9y}{7}$

   b) $\frac{9y^3}{(21y-21)}$

   c) $\frac{21y^2 - 42y + 21}{3y^3}$

   d) $\frac{7(y^2 - 2y + 1)}{y^2}$

6) Find the matrix x if $2x + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$

   a) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$ c) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ d) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$

7) In a given figure, ST || QR, PS = 2 cm and SQ = 3 cm. Then the ratio of the area of ΔPQR to the area of ΔPST is

   a) 25 : 4   b) 25 : 7   c) 25 : 11   d) 25 : 13

8) If ΔABC is an isosceles triangle with ∠C = 90° and AC=5 cm, then AB is

   a) 2.5 cm   b) 5 cm   c) 10 cm   d) $5\sqrt{2}$ cm

9) The point of intersection of 3x − y = 4 and x + y = 8 is

   a) (5, 3)   b) (2, 4)   c) (3, 5)   d) (4, 4)

10) A(0, 5) B(5, 0) C(−4, −7) are vertices of a triangle then its centroid will be at

   a) $\left(\frac{1}{3}, \frac{-2}{3}\right)$ b) $\left(\frac{-1}{3}, \frac{2}{3}\right)$ c) $\left(\frac{-1}{3}, \frac{-2}{3}\right)$ d) (1, −2)

11) If sin θ = cos θ, then 2 tan²θ + sin²θ − 1 is equal to

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

12) A frustum of a right circular cone is of height 16cm with radii of its ends as 8cm and 20 cm. Then the volume of the frustum is

a) 3328 πcm³   b) 3228 πcm³   c) 3240 πcm³   d) 3340 πcm³

13) The total surface area of a hemi sphere , is how much times the square of its radius

a) π   b) 4π   c) 3π   d) 2π

14) A purse contains 10 notes of Rs.2000, 15 notes of Rs.500, and 25 notes of Rs.200. One note is drawn at random what is the probability that the note is either a Rs.500 note or Rs.200 note?

a) $\frac{1}{5}$ b) $\frac{3}{10}$ c) $\frac{2}{3}$ d) $\frac{4}{5}$

Part - II

Answer any 10 questions. Q.No 28 is compulsory.   10×2=20

15) Find A × A and B × A if A = {m, n} and B = ϕ

16) A function f is defined by f(x) = 3 – 2x. Find x such that $f(x^2) = (f(x))^2$

17) 'a' and 'b' are two positive integers such that $a^b \times b^a = 800$. Find a and b.

18) Find the sum to infinity of 9 + 3 + 1 + ...

19) Determine the nature of roots for the quadratic equation $2x^2 - 2x + 9 = 0$

20) Construct a 3 × 3 matrix whose elements are given by aij = |i – 2j|

21) A man goes 18m due east and then 24m due north. Find the distance of his current position from the starting point?

22) If the three points (3, –1), (a, 3) and (1, –3) are collinear find the value of 'a'.

23) Find the slope and y intercept of $\sqrt{3}x + (1 - \sqrt{3})y = 3$.

24) A kite is flying at a height of 75m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string.

25) If the base area of a hemispherical solid is 1386 sq.metres then find its total surface area.

26) The standard deviation and coefficient of variation of a data are 1.2 and 25.6 respectively. Find the value of the mean.

27) A die is rolled and a coin is tossed simultaneously. Find the probability that the die shows an odd number and the coin shows a head.

28) Define: Ceva's theorem.

Part - III

Answer any 10 questions. Q.No 42 is compulsory.   10×5=50

29) Let A= {x ∈ W/x < 2}, B={x ∈ N/ 1 < x ≤4} and C = {3, 5}, Verify that

   i)   A × (B∪C) = (A × B) ∪ (A × C)

   ii) A × (B∩C) = (A × B) ∩ (A × C)

30) Consider the functions f(x) = x – 4, g(x) = x² and h(x) = 3x – 5. Show that (fog)oh=fo(goh)

31) Priya earned Rs.15,000 in the first month. Thereafter her salary increased by Rs.1500 per year. Her expenses are Rs.13,000 during the first year and the expenses increased by Rs.900 per year. How long will it take to save Rs.20,000 for month?

32) Find the sum to n terms of the series.

5 + 55 + 555 +

33) If $ax^4 + bx^3 + 361x^2 + 220x + 100$ is a perfect square, then find the vaules of 'a' and 'b'.

34) From a group of $2x^2$ black bees, square root of half of the group went to a tree. Again eight-ninth of the bees went to the same tree. The remaining two got caught up in a fragrant lotus. How many bees were there in total?

35) Show that the angle bisectors of a triangle are concurrent.

36) Find the area of the quadrilateral whose vertices are at $(-9, 0)$, $(-8, 6)$, $(-1, -2)$ and $(-6, -3)$.

37) Find the equation of the median and altitude of $\triangle ABC$ through A where the vertices are $A(6, 2)$, $B(-5, -1)$ and $C(1, 9)$

38) From the top of a tower 50 m high, the angles of depression of the top and bottom of a tree are observed to be $30°$ and $45°$ respectively. Find the length of the tree. $(\sqrt{3} = 1.732)$

39) A metallic sphere of radius 16 cm is melted and recast into small spheres each of radius 2 cm. How many small spheres can be obtained?

40) Find the coefficient of variation of 24, 26, 33, 37, 29, 31

41) In a class of 50 students, 28 opted for NCC, 30 opted for NSS and 18 opted both NCC and NSS. One of the students is selected at random. Find the probability that

i)   The student opted for NCC but not NSS.

ii) The student opted for NSS but not NCC

iii) The student opted for exactly one of them.

42) If $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$, $C = \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$, verify that $A(B + C) = AB + AC$

Part - IV

Answer all the questions.   **2×8=16**

43) a) Draw a circle of radius 4.5 cm. Take a point on the circle. Draw the tangent at the point using the alternate segment theorem.

(OR)

b) Draw a triangle ABC of base BC = 5.6 cm, $\underline{|A} = 40°$ and the bisector of $\underline{|A}$ meets BC at D such that CD = 4cm.

44) a) Draw a graph of $y = x^2 - 4x + 3$ and use it to solve $x^2 - 6x + 9 = 0$.

(OR)

b) A garment shop announces a flat 50% discount on every purchase of items for their customers. Draw the graph for the relation between the marked price and the Discount. Hence find

i)   the marked price when a customer gets a discount of Rs.3250 (from graph)

ii) The discount when the marked price is Rs.2500

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