HALF YEARLY EXAMINATION - 2022

STD - X

TIME : 3.00 Hrs

MATHS

MARKS : 100

PART - 1 (Marks 14)

Note : Answer ALL the questions : 14 x 1 = 14

1. If there are 1024 relations from a set $A = \{1, 2, 3, 4, 5\}$ to a set B, then the number of elements in B is a) 3 b) 2 c) 4 d) 8

2. If the order pairs $(a+2, 4)$ and $(5, 2a+b)$ are equal then, (a, b) is
   a) (2, -2) b) (5,1) c) (2,3) d) (3,-2)

3. If the HCF of 65 and 117 is expressible in the form of $65m-117$, then the value of m is
   a) 4 b) 2 c) 1 d) 3

4. Sum of the first n terms of the series $\sqrt{2}+\sqrt{8}+\sqrt{18}+.....$ is
   a) 1 b) $\sqrt{n}$ c) $\frac{n(n+1)}{2}$ d) $\frac{n(n+1)}{\sqrt{2}}$

5. If A is a 2 x 3 and B is a 3 x 4 matrix, how many columns does AB have
   a) 3 b) 4 c) 2 d) 5

6. $y^2+\frac{1}{y^2}$ is not equal to a) $\frac{y^4+1}{y^2}$ b) $\left(y+\frac{1}{y}\right)^2$ c) $\left(y-\frac{1}{y}\right)^2+2$ d) $\left(y+\frac{1}{y}\right)^2-2$

7. The sum and product of the roots are 9 and 14 respectively, then their appropriate quadratic equation is
   a) $x^2+9x+14=0$ b) $x^2-9x+14=0$ c) $x^2-14x+9=0$ d) $x^2+14x+9=0$

8. In a ΔABC, AD is the bisector of $\angle BAC$. if $AB = 8\ cm$, $BD = 6\ cm$ and $DC = 3\ cm$. The length of the side AC is
   a) 6cm b) 4 cm c) 3 cm d) 8 cm

9. The slope of the line which is perpendicular to a line joining the points (0,0) and (-8, -8) is
   a) -1 b) 1 c) 1 / 3 d) -8

10. If $x = a\tan\theta$ and $y = b\sec\theta$ then
    a) $\frac{y^2}{b^2}-\frac{x^2}{a^2}=1$ b) $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ c) $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ d) $\frac{x^2}{a^2}-\frac{y^2}{b^2}=0$

11. A spherical ball of radius r_1 units is melted to make 8 new identical balls each of radius r_2 units then $r_1 : r_2$ is
    a) 2 : 1 b) 1 : 2 c) 4 : 1 d) 1 : 4

12. The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is

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

13. The range of the data 8, 8, 8, 8, 8, ...8 is

a) 0 b) 1 c) 8 d) 3

14. The probability of getting a job for a person is $x / 4$. If the probability of not getting the job is 1 / 4, then the value of x is

a) 2 b) 1 c) 3 d) 1.5

PART - II (Marks - 20)

Note : Answer any 10 questions. Q. No. 28 is compulsory **10 x 2 = 20**

15. Let $f(x) = 2x+5$, if $x \neq 0$, then find $\frac{f(x+2)-f(2)}{x}$

16. $f(x) = 3x-2$, $g(x)=2x+k$ and $f \circ g = g \circ f$ the find the value k ?

17. A man has 532 flower pots. He wants to arrange them in rows such that each row contains 21 flower pots. Find the number of completed rows and how many flower pots are left over.

18. Find x so that $x+6$, $x+12$ and $x+15$ are consecutive terms of Geometric Progression

19. Find the excluded values of the expression $\frac{p^2+6p+8}{p^2+p-2}$

20. Determine the nature of roots for the quadratic equations $9x^2-24x+16=0$

21. $A = \begin{pmatrix} \cos\theta & 0 \\ 0 & \cos\theta \end{pmatrix}$ and, $B = \begin{pmatrix} \sin\theta & 0 \\ 0 & \sin\theta \end{pmatrix}$ then prove that $A^2+B^2 = I$

22. In ΔABC, $DE \parallel BC$, $AD = x$, $DB=x-2$, $AE=x+2$ and $EC = x-1$ then find the lengths of the sides AB.

23. If the area of the triangle formed by the vertices $A(-1,2)$, $B(k,-2)$ and $C(7,4)$ is 22 sq.units. Find the value of k

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

25. Prove that $\sin^2 A \cos^2 B + \cos^2 A \sin^2 B + \cos^2 A \cos^2 B + \sin^2 A \sin^2 B = 1$

26. Four persons live in a conical tent whose slant height is 19 cm. If each person requires 22 sq.cm of the floor area, then find the height of the tent.

27. Find the range and coefficient of range of the following data : 25, 67, 48, 53, 18, 39, 44

28. Express the sample space for rolling two dice using tree diagram.

PART - III (Marks - 50)

Note : Answer TEN questions. Q.No.42 is compulsory **10 x 5 = 50**

29. Let A = The set of all natural numbers less than 8, B = The set of all prime numbers less than 8, C = The set of even prime number. Verify that $A \times (B - C) = (A \times B) - (A \times C)$

30. The sum of the first n, $2n$ and $3n$ terms of an A.P. are S_1, S_2 and S_3 respectively. Prove that $S_3 = 3(S_2 - S_1)$

31. Find the sum of the series $(2^3 - 1^3) + (4^3 - 3^3) + (6^3 - 5^3) + \ldots\ldots$ to i) n terms ii) 8 terms

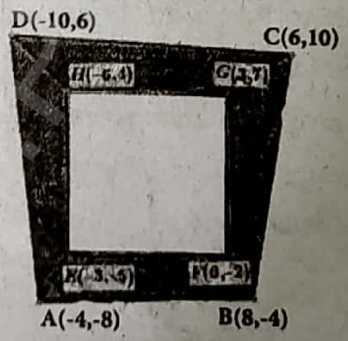
32. Find the square root of $289x^4 - 612x^3 + 970x^2 - 684x + 361$ $9x^2 + 12 + 28 + ax + b$

33. A passenger train takes 1 hr more than an express train to travel a distance of 240km from Chennai to Virudhachalam. The speed of passenger train is less than that of an express train by 20 km per hour. Find the average speed of both the trains.

34. If $A = \begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{pmatrix}$ then, verify that $(AB)^T = B^T A^T$

35. State and Prove Phythagoras theorem.

36. In the figure, quadrilateral swimming pool shown is surrounded by concrete patio. Find the area of patio.



37. From a window (h meters high above the ground) of a house in a street, the angles of elevation and depression of the top and the foot of another house on the opposite side of the street are θ_1 and θ_2 respectively. Show that the height of the opposite house is

$$h\left(1 + \frac{\cot\theta_2}{\cot\theta_1}\right)$$

38. A right circular cylindrical container of base radius 6 cm and height 15 cm is full of ice cream. The ice cream is to be filled in cones of height 9 cm and base radius 3 cm, having a hemispherical cap. Find the number of cones needed to empty the container.

39. A solid iron cylinder has total surface area of 1848 sq.m. Its curved surface area is five-sixth of its total surface area. Find the radius and height of the iron cylinder.

40. Find the coefficient of variation of 38, 40, 47, 44, 46, 43, 49, 53

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 students opted for NSS but not NCC
    iii) The students opted for exactely one of them.

42. The function 't' which maps temperature in Celcius (C) into temperature in Fahrenheit (F) is defined by t(C) = F, where $F = \frac{9}{5}C + 32$. Find
    (i) t(0) (ii) t(28) (iii) t(-10) (iv) the value of C when t(C)=212
    (v) the temperature when the Celsius value is equal to the Fahrenheit value.

PART - IV (Marks - 16)

Note : Answer both questions. **2 x 8 = 16**

43. (a) Draw a triangle ABC of base BC = 5.6cm, $\angle A$ = 40° and the bisectior of $\angle A$ meets BC at D such that CD = 4 cm. **(OR)**
    (b) Draw a circle of radius 4.5cm. Take a point on the circle. Draw the tangent at that point using the alternate segment theorem.

44. (a) Draw the graph of $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$ **(OR)**
    (b) Draw the graph of $xy = 24$, $x, y > 0$. Using the graph find,
    i) y when $x = 3$ and ii) x when $y = 6$.