10 - Std **Half Yearly Examination - 2022** **HMD**

Time : 3.00 hrs. *Mathematics* Marks : 100

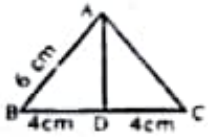
Note : i) Answer all the questions. ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer. 14 X 1 = 14

1. A = {a,d,p}, B = {2, 3}, C = {p,q,r,s} then n[(A ∪ C) X B] is
   a) 8 b) 20 c) 12 d) 16
2. Let $f(x) = \sqrt{1+x^2}$ then
   a) f(xy) = f(x) . f (y) b) f(xy) >f(x).f(y) c) f(xy) < f(x) . f(y) d)None of these
3. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
   a) 2025 b) 5220 c) 5025 d) 2520
4. The value of $(1^3 + 2^3 + 3^3 + \ldots\ldots\ldots\ldots + 15^3) - (1 + 2 + 3 + \ldots\ldots\ldots\ldots + 15)$ is
   a) 14400 b) 14200 c) 14280 d) 14520
5. The solution of $(2x - 1)^2 = 9$ is equal to
   a) - 1 b) 2 c) -1, 2 d) None of these
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 ΔLMN ∠L = 60°, ∠M= 50° If ΔLMN ~ ΔPQR then the value of ∠R is
   a) 40° b) 70° c) 30° d) 110°
8. 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)
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. (1 + tan θ + sec θ) (1 + cot θ - cosec θ) is equal to
    a) 0 b) 1 c) 2 d) -1
11. The height of a right circular cone whose radius is 5cm and slant height is 13cm will be
    a) 12 cm b) 10cm c) 13cm d) 5cm
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 standard deviation of a data is 3. If each value is multiplied by 5 then the new variance is
    a) 3 b) 15 c) 5 d) 225
14. The probability of getting a job for a person is $x/3$. then the value of x is
    a) 2 b) 1 c) 3 d) 1.5

II Note : Answer any 10 questions. Question No. 28 is compulsory. 10 X 2 = 20

15. If A = B = {p,q} find A X B, A X A.
16. If f(x) = 3 + x, g(x) = x - 4, check whether fog = gof.
17. Compute x, such that $10^4 \equiv x \pmod{19}$.
18. Which term of an AP 16, 11, 6, 1, ... is - 54.
19. Determine the quadratic equation, whose sum and product of roots are -9 and 20.
20. Construct a 3 X 3 matrix whose elements are given by $a_{ij} = |i-2j|$.

21. In the fig. AD is the bisector of $\angle A$. If BD = 4 cm, DC = 3 and AB = 6 cm find AC.



22. Show that point P (-1.5, 3), Q (6,-2) and R (-3, 4) are collinear.
23. Find the equation of a straight line which is parallel to the line 3x - 4y = 12 and passing through the point (6, 4).
24. Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \text{cosec}\,\theta + \cot\theta$.
25. Find the diameter of a sphere whose surface area is $154m^2$.
26. Find the range and coefficient of range of the following data 25, 67, 48, 53, 18, 39, 44.
27. Write the sample spaces for tossing three coins using tree diagram.
28. Solve : $2x^2 - 3x - 3 = 0$.

III Note : Answer any 10 questions. Question No. 42 is compulsory. 10 X 5 = 50

29. Let $A = \{x \in W / x < 2\}$, $B = \{x \in N / 1 < x \leq 4\}$ and $C = \{3,5\}$ verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.
30. Let $f : A \to B$ be a function defined by $f(x) = \frac{x}{2} - 1$, where A = {2,4,6,10,12}, B = {0,1,2,4,5,9} represent f by i) set of ordered pairs ii) table iii) and arrow diagram iv) graph
31. Find the HFC of 396, 504, 636.
32. Find the sum of $5^2 + 10^2 + 15^2 + \ldots\ldots\ldots\ldots + 105^2$.
33. Find the values of a and b if the following polynomial is perfect square $4x^4 - 12x^3 + 37x^2 + bx + a$.
34. State and prove "Baudhayana Theorem".
35. Find the area of the quadrilateral formed by the points (8,6), (5,11), (-5,12) and (-4, 3).
36. Find equation of the median and altitude of ΔABC through A where the vertices are A (6,2), B(-5, -1), C (1,9).
37. Two ships are sailing in the sea on the either sides of a light house. The angle of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively. If the lighthouse is 200m high, find the distance between the two ships. ($\sqrt{3} = 1.732$)
38. If the radii of the circular ends of a frustum which is 45m high are 28cm and 7Kcm find the volume of the frustum.
39. A right circular cylindrical container of base radius 6cm and height 15cm is full of ice cream. The ice cream is to be filled in cones of height 9cm and base radius 3cm, having a hemispherical cap. Find the number of cone needed to empty the container.
40. The number of television sold in each day of a week are 13, 8, 4, 9, 7, 12, 10. Find its standard deviation.
41. Two dice are rolled together, find the probability of getting a doublet or sum of faces as 4.
42. If $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ 1 & 4 \\ 0 & 2 \end{pmatrix}$ show that $(AB)^T = B^T A^T$.

IV Note : Answer all the questions. 2 X 8 = 16

43. a) Construct a triangle ΔPQR such the QR = 5cm, $\angle P = 30°$ and the altitude from P to QR is length 4.2cm. ***(OR)*** b) Draw the two tangents from a point which is 10cm away from the centre of the circle of radius 5cm. Also measure the lengths of the tangents.
44. b) A bus is travelling at a uniform speed 50km / hr. Draw the distance - time graph and hence find. i) Constant of variation. ii) How for will it travel in 1½ hr. iii) The time required to cover a distance of 300km from the graph. ***(OR)***
b) Draw the graph of $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$.