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Reg. No. ☐☐☐☐☐☐☐

Time : 2.30 hrs.

Half-Yearly Examination - 2022
MATHEMATICS

Max. Marks : 100

SECTION - I

I.   Choose the correct answer   14 x 1 = 14

1.   If { (a, 8), (6, b) } represents an Identify function, then the value of a and b are respectively
     a) (8, 6)   b) (8, 8)   c) (6, 8)   d) (6, 6)

2.   If f : A → B is a bijective function and if n(B) = 7 then n(A) is equal to
     a) 7   b) 49   c) 1   d) 14

3.   The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}$ ... is   a) $\frac{1}{24}$ b) $\frac{1}{27}$ c) $\frac{2}{3}$ d) $\frac{1}{81}$

4.   In a G.P If $t_1 = \frac{1}{5}$ and $t_2 = \frac{1}{25}$ then the common ratio is........   a) $\frac{1}{5}$ b) 5   c) 25   d) $\frac{2}{5}$

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

6.   The square root of $\frac{256 \, x^8 y^4 z^{10}}{25 x^6 y^6 z^6}$ a) $\frac{16}{5}\left|\frac{x^2 z^4}{y^2}\right|$ b) $16\left|\frac{y^2}{x^2 z^4}\right|$ c) $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ d) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$

7.   If ΔABC is an isosceles triangle with ∠C = 90° and AC = 5cm then AB is
     a) 2.5 cm   b) 5 cm   c) 10 cm   d) $5\sqrt{2}$ cm

8.   The area of triangle formed by the points (−5, 0) (0, −5) and (5, 0) is
     a) 0 sq.units   b) 5 sq.units   c) 5 sq.units   d) none of these

9.   If slope of the line PQ is $\frac{1}{\sqrt{3}}$ then slope of the perpendicular bisector of PQ is
     a) $\sqrt{3}$ b) $-\sqrt{3}$ c) $+\frac{1}{\sqrt{3}}$ d) 0

10. (secθ + tanθ) (secθ − tanθ) is......   a) 1   b) −1   c) sinθ   d) 0

11. If 5x = secθ and $\frac{5}{x}$ = tanθ then $x^2 - \frac{1}{x^2}$ is equal to   a) 25   b) $\frac{1}{25}$ c) 5   d) 1

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. If the standard deviation of x, y, z is p then the standard deviation of 3x + 5, 3y + 5, 3x + 5 is
     a) 3p + 5   b) 3p   c) p + 5   d) 9p + 15

14. The probability of getting a job for a person is $\frac{x}{3}$. If the probability of not getting the job is $\frac{2}{3}$ then the
   vlaue of x is   a) 2   b) 1   c) 3   d) 1.5

SECTION - II

II.   Answer any 10 questions only. 28 question is compulsory.   10 x 2 = 20

15. Find A x B if A = {2, −2, 3} and B = {1, −4}

16. A relation f : x → y is defined by f(x) = x² − 2 where x = {−2, −1, 0, 3} and y = R
     i) List the elements of f   ii) Is 'f' is a function

17. Write an A.P whose first term is 20 and common difference is 8.

18. If 1³ + 2³ + 3³ + ... + k³ = 44100 then find 1 + 2 + 3 + ... + k

19. Simplify $\frac{5t^3}{4t - 8} \times \frac{6t - 12}{10t}$

20. In the figure, AD is the bisector of ∠A
     If BD = 4cm DC = 3cm and AB = 6cm find AC

10 - Mathematics - 1
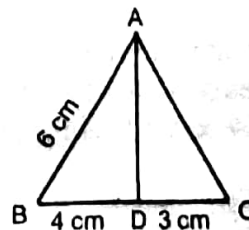
21. Find the area of triangle formed by the points $(1, -1)$ $(-4, 6)$ and $(-3, -5)$

22. Prove that $\sqrt{\dfrac{1+\cos\theta}{1-\cos\theta}} = \cosec\theta + \cot\theta$

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

24. Find the volume of a cylinder whose height is 2m and whose base area is 250cm.

25. If the total surface area of cone of radius 7cm is 704 cm².

26. The mean of a data is 25.6 and its co-efficient of variation is 18.75 find the standard deviation.

27. If A and B are two events such that $P(A) = \dfrac{1}{4}$ $P(B) = \dfrac{1}{2}$ and $P(A \text{ and } B) = \dfrac{1}{8}$ find
    i) P (A or B)　ii) P(not A and not B)

28. If α and β are the roots of $x^2 + 7x + 10 = 0$ find the value of $(\alpha - \beta)$

SECTION - III

Answer any 10 questions only. 42 Question is compulsory.　　　　　　$10 \times 5 = 50$

29. Let $f : A \rightarrow B$ be a function defined by $f(x) = \dfrac{x}{2} - 1$ where $A = \{2, 4, 6, 10, 12\}$ $B = \{0, 1, 2, 4, 5, 9\}$
    Represent by i) set of ordered pairs　ii) a table　iii) an arrow diagram　iv) a graph

30. If $f(x) = 2x + 3$ $g(x) = 1 - 2x$ and $h(x) = 3x$ prove that fo(goh) = (fog)oh

31. In an A.P sum of four consecutive term is 28 and the sum of their squares is 276 find the four numbers.

32. Find the sum to n terms of the series $5 + 55 + 555 + \ldots$

33. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, find the values of a and b.

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

35. State and prove pythagorous theorem.

36. Find the area of the Quadrilateral formed by the points $(8, 6)$ $(5, 11)$ $(-5, 12)$ and $(-4, 3)$

37. Find the equation of the perpendicular bisector of the line joining the points $A(-4, 2)$ and $B(6, -4)$

38. If $\dfrac{\cos\theta}{1+\sin\theta} = \dfrac{1}{a}$ then prove that $\dfrac{a^2-1}{a^2+1} = \sin\theta$

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

40. 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 hemisphere cap. Find the number of cones needed to empty the container.

41. The marks scored by 10 students in a class test are 25, 29, 30, 33, 35, 37, 38, 40, 44, 48. Find the standard deviation.

42. Three unbiased coins ~~are~~ ~~tossed once~~. Find the probability of getting atmost 2 tails or atleast 2 heads.

SECTION - IV

Answer the following　　　　　　　　　　　　　　　$2 \times 8 = 16$

43. a) Construct a $\triangle PQR$ such that QR = 5cm $\angle P = 30°$ and the altitude from P to QR of length 4.2 cm.
    (OR)
    b) Draw a circle of diameter 6cm from a point P, which is 8cm away from its centre. Draw the tangents PA and PB to the circle and measure their lengths.

44. a) Draw the graph of xy = 24, x, y > 0 using the graph find i) y when x = 3 and ii) x when y = 6
    (OR)
    Draw the graph of $y = x^2 - 4$ and here solve $x^2 - x - 12 = 0$

10 - Mathematics - 2

S.S.L.C [ANNOI ABIRAMI MATRICUL... 1'0'1'

HALF YEARLY – 2022

MATHS – TIRUPPUR

SECTION–I

I. One marks:

1] c] [0, 8]   10] a] 1

2] a] 7   11] b] $\frac{1}{25}$

3] b] $\frac{1}{27}$ 12] d] 3:1:2

4] a] $\frac{1}{5}$ 13] b] 3p

5] b] 4   14] b] 1

6] d] $\frac{16}{5}$, $\frac{x^3}{y}$

7] d] $5\sqrt{2}$ cm

8] 25 sq. units

9] b] $-\sqrt{3}$

B. MENALA M.sc, B.ed
Mathematics

II. Two marks:

15) $A \times B = \{ [2,1], [2,-4]$
     $[-2,1], [-2,-4]$
     $[3,1], [3,-4] \}$

16) $f(x) = x^2 - 2$
i] $f = \{2, -1, -2, 7\}$
ii] yes.

17] $a = 20, \ d = 8$
$t_n = 20 + [n-1] 8$
$\boxed{t_n = 12 + 8n}$

18] $1^3 + 2^3 + \dots + k^3 = 44100$
$\left[\frac{k[k+1]}{2}\right]^2 = (210)^2$
$1 + 2 + 3 + \dots + k = 210$

19] $\frac{5t^3}{4t-8} \times \frac{6t-12}{10t}$

$= \frac{5 \cdot t^2}{4[t-2]} \times \frac{6[t-2]}{10 t}$

$= \frac{3t^2}{4}$

20]
$\frac{AB}{AC} = \frac{BD}{DC}$

$\frac{6}{AC} = \frac{4}{3}$

$AC = \frac{3}{4} \times 6 = \frac{9}{2} = 4.5$

21]
Area $= \frac{1}{2} \begin{vmatrix} 1 & -1 \\ -4 & 6 \\ -3 & -5 \\ 1 & -1 \end{vmatrix} = \frac{1}{2} \left[(6-4) + (20+4) + (3+5) \right]$

$= \frac{1}{2} [2 + 36 + 8] = 24$ sq.unit

22]
$\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \sqrt{\frac{1+\cos\theta}{1-\cos\theta} \times \frac{1+\cos\theta}{1+\cos\theta}}$

$= \sqrt{\frac{(1+\cos\theta)^2}{1-\cos^2\theta}} = \frac{1+\cos\theta}{\sin\theta}$

$= \csc\theta + \cot\theta$

23) $\sqrt{3}x + (1-\sqrt{3})y = 3$

$(1-\sqrt{3})y = -\sqrt{3}x + 3$

$y = \frac{-\sqrt{3}}{1-\sqrt{3}} x + \frac{3}{1-\sqrt{3}}$

slope $= \frac{-\sqrt{3}}{1-\sqrt{3}} = \frac{-\sqrt{3}[1+\sqrt{3}]}{1^2-3} = \frac{\sqrt{3}}{2}[1+\sqrt{3}]$

$c = \frac{3}{1-\sqrt{3}}$

24] Cylinder:

$h = 2m$ | base area =

$\boxed{h = 200cm}$ | $\pi r^2 = 250$

Volume $= \pi r^2 h$.

$= 250 \times 200$

$= 50000 cm^3$

25] Cone:

$r = 7cm$.

T.S.A $= 704$

$\pi r [l + r] = 704$

$\frac{22}{7} \times 7 [l + 7] = 704$

$l + 7 = \frac{704}{22} \cdot \frac{32}{7}$

$\boxed{l = 32 - 7 = 25cm}$

26]

$\bar{x} = 25.6$

C.V $= 18.75$.

C.V $= \frac{\sigma}{\bar{x}} \times 100$.

$\sigma = \frac{18.75 \times 25.6}{100}$

$= \frac{480}{100}$

$= 4.8$

27] $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$, $P(A \cap B) = \frac{1}{8}$

i] $P(A \cup B) = \frac{1}{4} + \frac{1}{2} - \frac{1}{8}$

$= \frac{5}{8}$

ii] $P(\overline{A \cap B}) = \frac{3}{8}$

28) $\alpha + \beta = -7$

$\alpha \beta = 10$.

$\alpha - \beta = \sqrt{(\alpha + \beta)^2 - 4 \alpha \beta} = \sqrt{(-7)^2 - 4(10)}$

$= \sqrt{49 - 40} = \sqrt{9} = 3 //$

III.

29] $f(x) = \frac{x}{2} - 1$

i] Ordered.
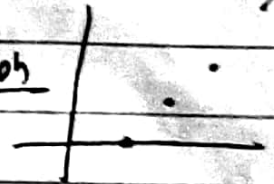
$f = \{ [2, 0], [4, 1], [6, 2]$

$[10, 4], [12, 5] \}$

ii] table

2	4	6	10	12
0	1	2	4	5

iii]

iv] graph

30] $f(x) = 2x + 3$, $g(x) = 1 - 2x$.

$h(x) = 3x$.

$goh = 1 - 2[3x] = 1 - 6x$

$\boxed{fo(goh) = 2(1 - 6x) + 3 = 2 - 12x + 3 = 5 - 12x}$

$fog = 2(1 - 2x) + 3 = 2 - 4x + 3$

$(fog) oh = 5 - 4x = 5 - 4[3x]$

$(fog) oh = 5 - 12x$

$(fog) oh = fo(goh)$ //

32] $S_n = 5 + 55 + 555 + \ldots n$ terms

$= 5[1 + 11 + 111 + \ldots]$

$= \frac{5}{9}[9 + 99 + 999 + \ldots]$

$= \frac{5}{9}[(10 + 10^2 + \ldots) - (n)]$

$= \frac{5}{9}\left[10\left[\frac{10^n - 1}{10 - 1}\right]\right] - \sum \frac{n}{9}$

$= \frac{50}{81}[10^n - 1] - \sum \frac{n}{9}$.

33]

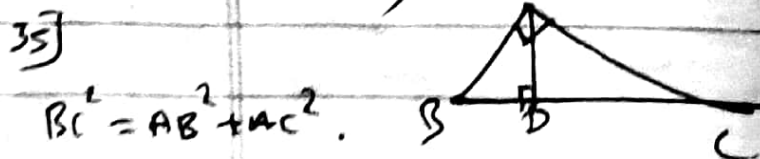|	3	2	4		
3	9	12	+28	a	b
	9				
6 2	12	28			
	12	4			
6 4 4	24	a	b		
	24	16	16		
	0				
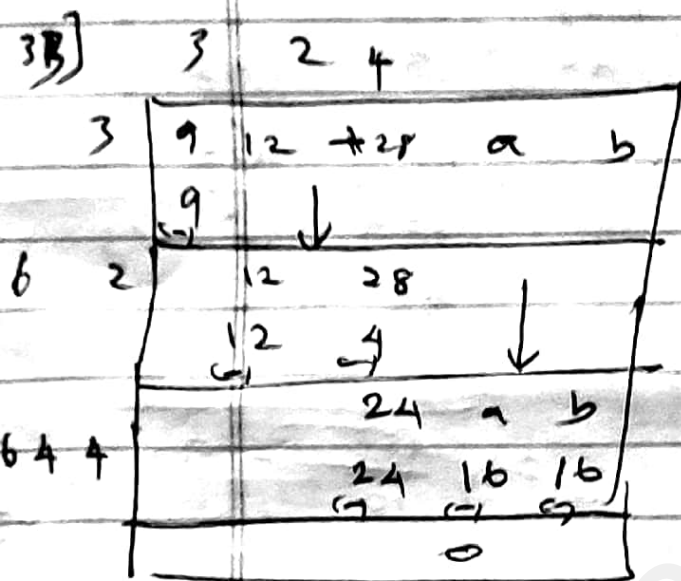
$a = 16, \quad b = 16.$

34] $AB = \begin{bmatrix} 52 & 30 \\ 43 & 3 \end{bmatrix}$

$(AB)^T = \begin{bmatrix} 52 & 43 \\ 30 & 3 \end{bmatrix} \rightarrow ①$

$B^T A^T = \begin{bmatrix} 52 & 43 \\ 30 & 3 \end{bmatrix} \rightarrow ②$

$(AB)^T = B^T A^T$

35]

$BC^2 = AB^2 + AC^2.$

36]

$Area = \frac{1}{2}\begin{vmatrix} 5 & 6 \\ 5 & 11 \\ -5 & 12 \\ -4 & 3 \\ 0 & 6 \end{vmatrix} = \frac{1}{2}\left[\begin{array}{c} (88 - 60) + (60 + 55) \\ +(-15 + 48) \\ +[-24 - 34] \end{array}\right]$

$= \frac{1}{2}[58 + 115 + 33 - 40]$

$= \frac{1}{2}[158] = 79.$

37] slope $(\theta) = \frac{-4 - 2}{6 + 4} = \frac{-6}{10} = \frac{-3}{5}$

$\perp^r$ slope, $\boxed{m = 5/3}$

mid point $= \left[\frac{-4 + 6}{2}, \frac{2 - 4}{2}\right]$

$= [1, -1]$

$y - y_1 = m(x - x_1)$

$y + 1 = \frac{5}{3}(x - 1)$

$3y + 3 = 5x - 5$

$\boxed{5x - 3y - 8 = 0}$

38] $\frac{\cos\theta}{1 + \sin\theta} = \frac{1}{a}$

Let $\frac{a^2 - 1}{a^2 + 1} = \sin\theta$

$a = \frac{1 + \sin\theta}{\cos\theta} = \sec\theta + \tan\theta$

$a^2 = \sec^2\theta + \tan^2\theta + 2\sec\theta\tan\theta$

$a^2 - 1 = \sec^2\theta + \tan^2\theta + 2\sec\theta\tan\theta - 1$

$= \sec^2\theta + \tan^2\theta + 2\sec\theta\tan\theta - \sec^2\theta + \tan^2\theta$

$\boxed{a^2 - 1 = 2\tan^2\theta + 2\tan\theta\sec\theta}$

$\boxed{a^2 + 1 = 2\sec^2\theta + 2\tan\theta\sec\theta}$

$$\frac{a^2-1}{a^2+1} = \frac{\tan\theta[\tan\theta + \sec\theta]}{\sec\theta[\tan\theta + \sec\theta]}$$

$$= \frac{6 \times 6 \times \cancel{16}^{5}}{\frac{1}{\cancel{2}} \times \cancel{3} \times \frac{4}{3} \times \cancel{6}^{3}} = 20$$

$$= \frac{\sin\theta}{\cos\theta} \times \cos\theta = \sin\theta$$

36]

Soln

$$\tan 45° = \frac{50}{x}$$

$$\boxed{x = 50}$$

$$\tan 30° = \frac{50-y}{50}$$

$$\frac{1}{\sqrt{3}} \times 50 = 50 - y$$

$$y = 50 - \frac{50}{\sqrt{3}}$$

$$= 50\left[1 - \frac{1}{\sqrt{3}}\right]$$

$$= 50 \times 0.58$$

$$\boxed{y = 28.8m}$$

40]

Cylinder	Cone
$r_1 = 6$	$r_2 = 3a$
$h_1 = 15$	$h_2 = 90$

$$\text{number of cone} = \frac{\text{Volume of Cylinder}}{\text{Volume of cone}}$$

$$= \frac{\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$$

41]

	$d = x - 35$	d^2
25	-10	100
29	-6	36
30	-5	25
33	-2	4
35	0	0
37	2	4
38	3	9
40	5	25
44	9	81
46	13	169

$$\Sigma d = 9 \qquad \Sigma d^2 = 453$$

$$\sigma = \sqrt{\frac{\Sigma d^2}{n} - \left(\frac{\Sigma d}{n}\right)^2}$$

$$= \sqrt{\frac{453}{10} - \left(\frac{9}{10}\right)^2}$$

$$= \sqrt{45.3 - 0.81}$$

$$= \sqrt{44.49} \quad 26.67$$

42]

$$\boxed{n(S) = 8}$$

$$n(A) = 7 \qquad \qquad n(B) = 4$$

$$\boxed{P(A) = 7/8} \qquad P(B) = 4/8$$

$$n(A \cap B) = 4/8$$

$$\boxed{P(A \cup B) = 7/8}$$