TIRUVALLI

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SECOND MID TERM TEST - NOVEMBER 2019

STANDARD - X

MATHEMATICS

TIME: 1.30 hrs **MARKS:50**

Part - I (7 Marks) 7 x 1 = 7

I. **Note: i) Answer all the 7 questions.**
ii) Choose the most suitable answer from the given four alternatives.

1. If A is a 2×3 matrix and B is a 3×4 matrix, how many columns does AB have
a) 3 b) 4 c) 2 d) 5
2. Transpose of a column matrix is
a) unit matrix b) diagonal matrix
c) column matrix d) row matrix
3. How many tangents can be drawn to the circle from an exterior point?
a) one b) two c) infinite d) zero
4. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3}:1$, then the angle of elevation of the sum has measure.
a) 45° b) 30° c) 90° d) 60°
5. The angle of elevation of a cloud from a point h metres above a lake is β. The angle of depression of its reflection in the lake is 45°. The height of location of the cloud from the lake is
a) $\frac{h(1+\tan\beta)}{1-\tan\beta}$ b) $\frac{h(1-\tan\beta)}{1+\tan\beta}$ c) h tan (45°–β) d) none of these
6. The total surface Area of a hemisphere is how much times the square of its radius.
a) π b) 4π c) 3π d) 2π
7. 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

Part II (10 marks) 5 x 2 = 10

Note (i) Answer any 5 questions only.
(ii) Question No 13 is Compulsory.

8. Determine the nature of the roots of a Quatratic equation $x^2 - x - 1 = 0$
9. Define : (i) squre matrix
(ii) scalar matrix
10. Solve for x, y :

$$\begin{pmatrix} x^2 \\ y^2 \end{pmatrix} + 2\begin{pmatrix} -2x \\ -y \end{pmatrix} = \begin{pmatrix} -5 \\ 8 \end{pmatrix}$$

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11. If radii of two concentric circles are 4cm and 5cm then find the length of the chord of one circle which is a tangent to the other circle.
12. Find the angle of elevation of the top of a tower from a point on the ground, which 30cm away from the foot of a tower of height $10\sqrt{3}$ m.
13. The ratio of the volumes of two cones is 2 : 3. Find the ratio of their radii if the height of second cone is double the height of the first.

Part III (25 Marks)

Note: 1) Answer any 5 questions only. **5 x 5 = 25**
2) Question No 19 is Compulsory.

14. If α, β are the roots of the equation $3x^2 + 7x - 2 = 0$, find the values of

i) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ ii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$

15. If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ Show that $A^2 - (a+d)A = (bc - ad)I_2$
16. State and prove pythagoras Theorem.
17. From the top of a light house, the angle of depresion of two ships on the opposite sides of it are observed to be 30° and 60°. If the height of the light house is h metres and line joining the ships passes through the foot of the lighthouse, show that the distance between the ships is $\frac{4h}{\sqrt{3}}$ m
18. A toy is in the shape of a cylinder surmounted by a hemisphere. The height of the toy is 25 cm. Find the total surface area of the toy if its common diameter is 12 cm.
19. A solid sphere of radius 6cm is melted into a hollow cylinder of uniform thinkness. If the external radius of the basè of the cylinder is 5 cm and its height is 32 cm, then find the thinkness of the cylinder.

Part IV (8 Marks)

Note: Answer the following: **1 x 8 = 8**

20. a) Draw a circle of radius 4 cm. At a point L on it draw a tangent to the circle using the alternate segment.

(Or)

b) Draw the two tangents from a point which is 10 cm away from the centre of a circle of radius 5 cm. Also, measure the lengths of the tangents.

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COMMON II MIDTERM 'X'

MATHS

1. b) 4
2. d) rowmatrix
3. b) two
4. a) 60°
5. a) $\frac{h(1+\tan\beta)}{1-\tan\beta}$
6. c) 3π
7. a) 2 : 1.

8. $\Delta = (-1)^2 - 4(1)(-1) = 5 > 0$

Real & unequal.

9. i) Number of rows and columns equal

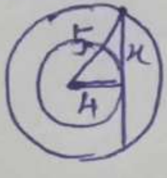
(ii) A diagonal matrix, have same non-zero number in the leading diagonal.

10. $x^2 - 4x - 5 = 0 \quad x = \{-1, 5\}$

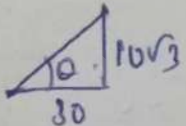
$y^2 - 2y - 8 = 0 \quad y = \{-2, 4\}$

11. $x = \sqrt{5^2 - 4^2} = \sqrt{9} = 3$.

length of chord = 6cm



12. $\tan\theta = \frac{10\sqrt{3}}{30} = \frac{1}{\sqrt{3}}$



$\theta = 30^\circ$

13. (a). $V_1 : V_2 = 2/3 \quad h_1 = h \quad h_2 = 2h$.

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

$\frac{r_1^2}{r_2^2} \times \frac{h}{2h} = 2/3$

$\frac{r_1^2}{r_2^2} = 4/3 \Rightarrow$ $r_1 : r_2 = 2 : \sqrt{3}$

5marks

14. $\alpha + \beta = -7/3 \quad \alpha\beta = -2/3$

i) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{(\alpha+\beta)^2 - 2\alpha\beta}{\alpha\beta} = \frac{(-7/3)^2 - 2(-2/3)}{-2/3}$

$= -61/6$

(ii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{(-7/3)^3 - 3(-2/3)(-7/3)}{-2/3}$

$= 469/18$

15) $A^2 = \begin{pmatrix} a^2+bc & ab+bd \\ ac+cd & bc+d^2 \end{pmatrix}$

$(a+d)A = \begin{pmatrix} a^2+ad & ab+bd \\ ac+cd & ad+d^2 \end{pmatrix}$

$A^2 - (a+d)A = (bc - ad) I_2$

16). $\triangle ABC \sim \triangle ABD$

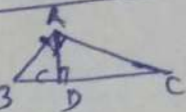
$\frac{BC}{AB} = \frac{AB}{BD}$

$AB^2 = BC \times BD$

$\triangle ADC \sim \triangle ADC B$

$\frac{BC}{AC} = \frac{AC}{DC}$

$AC^2 = BC \times DC$



$\therefore AB^2 + AC^2 = BC^2$

17) $\tan 30^\circ = h/x$

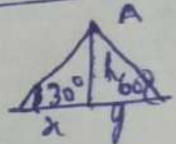
$x = h\sqrt{3}$

$\tan 60^\circ = h/y$

$y = h/\sqrt{3}$

$x + y = h\sqrt{3} + h/\sqrt{3}$

$= 4h/\sqrt{3}$

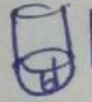


18).

$h = 12cm$

$r = 6cm$

$r = 6cm$



25cm

TSA = CSA Cylinder + CSA hemisphere + Top area

$= 2\pi rh + 2\pi r^2 + \pi r^2 = \pi r(2h + 3r)$

$= 1056 \text{ cm}^2$

19).

$r_1 = 6cm$

$R = 5cm$, $r_2 = ?$ $h = 32cm$

$w = ?$

$4/3 \pi r_1^3 = \pi(R^2 - r_2^2)h$

$\frac{4 \times 6 \times 6 \times 6}{32} = (25 - r_2^2)$

$9 = 25 - r_2^2$

$r_2^2 = 16$

$r_2 = 4cm$

$w = 1cm$

20 (b) length of tangent $= \sqrt{75} = 8.66$

$\simeq 8.7cm$