

TERM TEST PAPER

COMBINED MATHS – PURE MATHS

Grade - 12 (1st Term Exam)

Duration : 1 hour

NO. 02

Marks

$$25 \times 10 = 250$$

♦ answer all the questions.

Part A

Short Questions

01. Find domain and range of following fuⁿs

$$\text{i) } f(x) = \frac{(2x+1)}{(2x^2-1)}$$

ii) $g(x) = -x^2 + 4x + 8$

02. a) Solve the eqⁿ $\log_2 x + \log_x 8 = 4$

b) Express $\frac{2.3\overline{2}}{0.\overline{1}\overline{7}}$ as a rational number

03. Solve the equation $\sqrt{3-x} - \sqrt{7+x} = \sqrt{16+2x}$

04. $f(x) = \cos^2 x + 2\sqrt{3} \sin x \cos x - \sin^2 x + 3$. Find the greatest and least values of $f(x)$.

05. If $f(x) = \frac{5^x - 5^{-x}}{5^x + 5^{-x}}$ then show that $x = \frac{1}{2} \log_5 \left[\frac{f(x) + 1}{1 - f(x)} \right]$

06. B (3, 1), D (t-1, t+1), where t is a parameter. If BD = $\sqrt{10}$ find possible values of t. If D is on the y axis and the mid point of BD is $\left(\frac{a}{2}, \frac{a}{2}\right)$. Evaluate a.

07. If $2A + B = \frac{\pi}{3}$ then prove that $\tan B = \frac{\sqrt{3} - 2 \tan A - \sqrt{3} \tan^2 A}{1 + 2\sqrt{3} \tan A - \tan^2 A}$

08. A (2,5) , B (7,1), C (4,3) , D (-1,7). show that diagonal AC divides the area of the quadrilateral ABCD into two equal parts.

09. An arc of length $\frac{11\pi}{3}$ cm of a circle of radius 2 cm subtends θ angle at the centre.

 - Find θ
 - Find the area of the sector
 - Find the area of the segment
 - Find the length of the chord.

10. Show that $3(\sin \theta - \cos \theta)^4 + 6(\sin \theta + \cos \theta)^2 + 4(\sin^6 \theta + \cos^6 \theta)$ expression is independent of θ

Grade - 12

**Part B
Essay Questions**

1st Term Exams

Time Durations

Marks
$150 \times 5 = 750$
Total = 1000

1 hours

$\frac{1}{2}$ hours

11. a) Show that $(\cos\alpha + \cos\beta)^2 + (\sin\alpha + \sin\beta)^2 = 4\cos^2\left(\frac{\alpha-\beta}{2}\right)$. Hence show that
 $\cos 15^\circ = \frac{\sqrt{2}+\sqrt{6}}{4}$

- b) If $\sin x + \sin y = a$ and $\cos x + \cos y = b$, then show that $\sec^2\left(\frac{x-y}{2}\right) = \frac{4}{a^2 + b^2}$

- c) using usual notations show that $\frac{\sin(B-C)}{bc} + \frac{\sin(C-A)}{ca} + \frac{\sin(A-B)}{ab} = 0$

12. a) Resolve $\frac{4x^2+11}{(x^2+1)^2-x^2-3}$ into partial fractions using a suitable substitution
 (once you removed the substitution, you need to leave the answer in a standard form)

- b) Find the range of $x \in \mathbb{R}$ satisfying the inequality,

$$\frac{(x^3 - x^2 - 5x - 3)(x^2 + 2x - 4)}{x^3 - 3x^2 - 4x + 12} \leq 0$$

13. Equations of sides AB, BC and CA are $x + y + 4 = 0$, $7x + y - 8 = 0$ and $x + 7y - 8 = 0$ respectively.

- i) Find equations of perpendicular bisectors.
 ii) Hence find the circumcentre of the triangle ABC

14. In the parallelogram ABCD, eqⁿs of sides AB & BC are $x + 4y - 14 = 0$ and $5x + y - 13 = 0$ respectively. D is (-1, 1).

- i) Find eqⁿs of sides AD and DC
 ii) AC and BD diagonals are meeting at E. Find coordinates of E. The line drawn parallel to BC, along the point E cuts AB and CD at points P and Q respectively
 iii) Find the area of the triangle OPQ.
 iv) If point R is placed on PQ such that PR:RQ = 3:2, find the coordinates of R.

15. a) Solve the eqⁿ $\tan^3 x - 3\tan^2 x - 3\tan x + 1 = 0$

- b) Prove the identity $\frac{\tan x - \sin x}{\sin^3 x} = \frac{\sec x}{1 + \cos x}$

- c) Show that if $y = \tan\left(x + \frac{\pi}{12}\right)\cot\left(x - \frac{\pi}{12}\right)$ then $y + 1 = 2(y - 1)\sin 2x$

- d) Express $f(\theta) = 32\cos^6 \theta - 48\cos^4 \theta + 18\cos^2 \theta$ in the form of $f(\theta) = A\cos B\theta + C$
 where A, B, C are constants to be determined. Hence solve $f(\theta) = \frac{1}{2}$

Student's Details

Name :-

School :-

Mobile No :-

Marks