

TERM TEST PAPER

COMBINED MATHS – PURE MATHS

Grade - 12 (1st Term Exam)

Duration : 1 hour

Marks
25 × 10 = 250

♦ answer all the questions.

Part A
Short Questions

01. Find domain and range of following fuⁿs

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 $\frac{2.3\overline{2}}{0.1\overline{7}}$ as a rational number

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

- i) Find θ
- ii) Find the area of the sector
- iii) Find the area of the segment
- iv) 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

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

Grade - 12

Part B

Essay Questions

1st Term Exams

Time Durations $2\frac{1}{2}$ 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 $f(\theta) = \frac{1}{2}$

