TED (15/19) - 1002
(REVISION-2015/19)

N 23 - 0007202

Reg.No……………..
Signature……………

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE - NOVEMBER 2023

ENGINEERING MATHEMATICS I

(Maximum Marks:100) (Time: 3 hours)

PART - A
(Maximum Mark : 10)

Marks

I. Answer **all** the questions in one or two sentences. Each question carries 2 marks.

1. Evaluate $\underset{x\to 0}{\mathrm{lt}} \frac{2x-3}{3x+4}$
2. Find Sin 60º Cos 30º + Cos 60º Sin 30º
3. Find the area of a triangle given b = 3cm, c = 2cm and A = 30º
4. Find $\frac{dy}{dx}$ if $y = e^x \log x$
5. Find the range of values of x for which $y = 2x^2 - 8x + 1$ increasing (5 x 2 = 10)

PART - B
(Maximum Mark: 30)

II Answer ***any five*** questions from the following. Each question carries 6 marks.

1. Express $\sqrt{3}$ Cos x + Sin x in the form R Sin (x + α) where α is acute.
2. Find the value of tan 75º without using tables and hence show that
   tan 75º + Cot 75º = 4
3. Prove that $R(a^2 + b^2 + c^2) = abc$ (Cot A + cot B + Cot C).
4. Differentiate Cos x by the method of first principle.
5. If $x = \frac{1-t^2}{1+t^2}$ $y = \frac{2t}{1+t^2}$ Find $\frac{dy}{dx}$?
6. Find the equation of the tangent and normal to the curve $y = x^2 + x - 1$ at (2,5)
7. A cylindrical can open at one end is to have a volume of 64π cm^3. Find the radius and height of the cylinder such that the metal used its minimum?

(5 x 6 = 30)

PART – C

(Maximum Mark: 60)

(Answer ***one full*** question from each unit. Each full question carries 15 marks.)

UNIT – 1

III. a) If Cos $A = \frac{3}{5}$ tan $B = \frac{5}{12}$ A & B are acute angles.

Find Sin (A +B) & Cos (A + B). (5)

b) prove that $\frac{\text{Sec}\,\theta}{\text{Sec}\,\theta-1} + \frac{\text{Sec}\,\theta}{\text{Sec}\,\theta+1} = 2\,Cosec^2\ \theta$ (5)

c) Prove that $\frac{Cos\,(90+A)\,Sec\,(360+A)\ \tan(180-A)}{Sec\,(A-720)\,Sin\,(540+A)\,Cot\,(A-90)} = 1$ (5)

OR

IV. a) Prove that Sin (A + B) Sin (A - B) = $\text{Sin}^2 A - \text{Sin}^2 B$ (5)

b) If $\boldsymbol{\theta}$ = 30°, Verify that tan $2\theta = \frac{2\tan\theta}{1-tan^2\theta}$ (5)

c) The horizontal distance between two towers is 50m and the angle of depression of the first tower as seen from the second which is in 150m height is 60°. Find the height of the first tower? (5)

UNIT – II

V. a) Prove that $\frac{1+Cos\,2A}{Sin\,2A}$ = Cot A and deduce the value of Cot 15°. (5)

b) Show that Cos 55° + Cos 65° + Cos 175° = 0 (5)

c) Solve ΔABC given a = 5cm, b = 8 cm c = 30° (5)

OR

VI. a) Prove that Sin 10° Sin 30° Sin 50° Sin 70° = $\frac{1}{16}$ (5)

b) Prove that 2 (bc Cos A + ca Cos B + ab Cos c) = $a^2 + b^2 + c^2$ (5)

c) Two angles of a triangular plot of landare 53°17' and 67°9' the side between them is measured to be 100m. How many meters of fencing is required to fence the plot? (5)

UNIT – III

VII. a) Evaluate $\lim_{x \to a} \frac{x^{1/2} - a^{1/2}}{x^{1/3} - a^{1/3}}$ (5)

b) If y = a sin mx prove that $y^{||} + m^2 y = 0$ (5)

c) If y = a cos (log x) + b sin (log x) show that $\frac{x^2 d^2 y}{dx^2} + \frac{xdy}{dx} + y = 0$ (5)

OR

VIII. a) Evaluate $\underset{x \to 5}{lt} \frac{x^3 - 125}{x^2 - 25}$ (5)

b) Find $\frac{dy}{dx}$ if (i) $x = at^2$ $y = 2at$

(ii) $y = \frac{\text{Sin } 2x}{1 + \text{Cos } 2x}$ (5)

c) If $y = \sin^{-1} x$ P.T $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0$ (5)

UNIT - IV

IX. a) The displacement of a body is given by $x = 3 \text{ Cos } 4t + 5 \text{ Sin } 4t$. Show that the acceleration varies as the distance. (5)

b) Find the maximum and minimum value of $4x^3 + 9x^2 - 12x + 2$ (5)

c) A Circular plate of radius 3 inches expands when heated at the rate if 2 inch/sec. Find the rate at which the area of the plate is increasing at the end of 3 sec? (5)

OR

X. a) For what values of x is the tangent to the curve $\frac{x}{x^2+1}$ is parallel to the x – axis. (5)

b) The perimeter of a rectangle is 100m. Find the sides when the area is maximum? (5)

c) A balloon is spherical in shape. Gas is escaping from it at the rate of 10cc/Sec. How fast is the surface area shrinking when the radius is 15cm? (5)

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