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

A23 - 09646

Reg. No……………………
Signature ………………….

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2023

ENGINEERING MATHEMATICS – I

[Maximum Marks: **100**] [Time: **3** Hours]

PART-A

[Maximum Marks: **10**]

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

1. Find the value of tan 150^0.
2. If $\tan\alpha = {}^{12}/_{5}$ and α is an acute angle, Find $cos\ \alpha$.
3. Find the area of triangle having a=4, b=2, $C = 30°$.
4. Evaluate $\lim_{x\to 3}\frac{x^3-27}{x-3}$
5. Find the slope of $y = x^{3/2}\ at\ x = 1$. (5 x 2 = 10)

PART-B

[Maximum Marks: **30**]

II. (Answer any ***five*** of the following questions. Each question carries **6** marks)

1. Prove that $\cos(A+B)\cos(A-B) = cos^2 A - sin^2 B$.
2. Prove that $sin\ 120^0 \cos 330^0 + \cos 240^0 \sin 330^0 = 1$.
3. Prove that R $(a^2+b^2+c^2) = abc(\cot A + \cot B + \cot C$.
4. The sides of a triangle are in the ratio 4:5:6. Find the angles of the triangle.
5. Using the quotient rule find the derivative of tan *x*.
6. If $y = x^2\ cosx$, prove that $x^2\frac{d^2y}{dx^2}$ - $4x\frac{dy}{dx} + (x^2+6)y = 0$
7. Prove that a rectangle of fixed perimeter has its maximum area when it becomes a square.

(5 x 6 = 30)

PART-C

[Maximum Marks: **60**]
(Answer ***one*** full question from each Unit. Each full question carries **15** marks)

UNIT - I

III. (a) Prove that $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$. (5)

(b) If $\sin A = {}^{3}/_{5,} \cos B = {}^{12}/_{13}$ $and\ A\ and\ B\ are\ acute\ angles, find$ $\tan(A+B)$. (5)

(c) Express $\sqrt{3}\cos x + \sin x$ $in\ the\ form$ $R\sin(x+\alpha)$. (5)

OR

IV. (a) Prove that $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\ cosec\ \theta$. (5)

(b) If A+B = 45^0, show that (1+tan A) (1+tan B) =2. (5)

(c) A light house is 20 metres high. An observer on the top of the light house observes a boat at an angle of depression 30^0. How far is the boat from the observer? (5)

UNIT - II

V. (a) Prove that $1 + tan\theta \tan 2\theta = sec2\theta$. (5)

(b) Show that $\cos 55^0 + cos65^0 + \cos 175^0 = 0$. (5)

(c) Show that $a(b\cos C - c\ cosB) = b^2 - c^2$. (5)

OR

VI. (a) Prove that $\frac{sin3A}{sinA} - \frac{\cos 3A}{cosA} = 2$. (5)

(b) Show that $\sin 10°, sin\ 50° \sin 70^0 = {}^{1}/_{8}$. (5)

(c) Solve the triangle, given a = 87cm, b=53cm and C=70^0. (5)

UNIT- III

VII. (a) Evaluate $lim_{x\to\infty} \frac{3x^{2-}5x+9}{2x^2+4x+7}$ (5)

(b) Find $\frac{dy}{dx} if$ i) $y = x^2 sin^{-1}x$ ii) $y = \log\sin x$. (3+2=5)

(c) If $y = \sin x \cos x,\ show\ that\ \frac{d^2y}{dx^2} + 4y = 0$. (5)

OR

VIII. (a) Evaluate i) $\lim_{x\to 0}\frac{2x^2+3x}{3x^2-4x}$ ii) $\lim_{x\to 0}\frac{\sin 3x}{x}$. (3+2=5)

(b) Using first principles, find the derivative of $\sqrt{x}$. (5)

(c) If $y = tan^{-1}x,\ prove\ that\ (1+x^2)\,y'' + 2xy' = 0$. (5)

UNIT - IV

IX. (a) Find the equation of the tangent and normal to the semi circle

$y = \sqrt{25 - x^2}\ at\ the\ point\ (4,3)$. (5)

(b) The distance travelled by a particle moving along a straight line after *t* time is given by

$s = 2t^3 - 9t^2 + 12t + 6.\ find\ the\ value\ of\ t\ when\ acceleration\ is\ zero.$ (5)

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

OR

X. (a) Prove that the function $x^3 - 3x^2 + 6x + 7$ is an increasing function for all real values of x. (5)

(b) A spherical balloon is inflated by pumping 25cc of gas per second. Find the rate at which the radius of the balloon is increasing when its radius is 15cms. (5)

(c) The deflection of a beam is given by $y = 2x^3 - 9x^2 + 12x.\ find\ the\ maximum\ deflection.$ (5)

****