TED(15/19)1002 **N25-7793** Reg.No............................

(Revision-2015/19) Signature..........................

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, NOVEMBER-2025

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. Prove that $(1 + cosA)(1 - cosA) = sin^2 A$.
2. Write the expression for cos3A.
3. Find the derivative of $y = xe^x$.
4. Find the slope of the tangent to the curve $y = 3x^2 + x + 2$ at (1, 2).
5. Write the conditions for maxima. (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 $\frac{sin\theta}{1+Cos\theta} + \frac{1+cos\theta}{sin\theta} = 2\ cosec\theta$.
2. Express $\sqrt{3}\,cosx + sinx$ in the form R sin($x+\propto$) $where \propto$ is acute.
3. Show that cos 20 cos 40 cos 60 cos80 = $\frac{1}{16}$.
4. SolveΔABC given a = 4cm, b = 5cm, c = 7cm.
5. Differentiate cos x by the method of first principle.
6. Air is pumped in to a spherical rubber bladder of radius 3. If the radius increases at a uniform rate of 1 per minute find the rate at which the volume is increasing at end of 3 minutes.
7. Find the equation of the tangent and normal to the curve y=4ax at (a, 2a).

(5 x 6= 30)

PART – C

[Maximum marks: 60]

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

UNIT –I

III. (a). If $\tan\theta = 1$, find $\sin\theta$ and $\cos\theta$. (5)

(b). Prove that $\frac{\tan 60 - \tan 45}{1 + \tan 60 \tan 45} = 2-\sqrt{3}$. (5)

(c). Prove that $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\,\mathrm{cosec}\theta$. (5)

OR

IV. (a). Evaluate cos570 sin510- sin330 cos390. (5)

(b). A man casts a shadow 3m long when the Sun's altitude is 30^0. Find the height of the man.(5)

(c). If $\cos A = \frac{3}{5}$, $\tan B = \frac{5}{12}$, A and B are acute angles, find the value of sin(A+B). (5)

UNIT-II

V. (a). Prove that $\frac{1+\cos 2A}{\sin 2A}$ + cot A and deduce the value of cot15. (5)

(b). Prove that $\frac{\sin 2\alpha + \sin 5\alpha - \sin\alpha}{\cos 2\alpha + \cos 5\alpha + \cos\alpha} = \tan 2\alpha$ (5)

(c). Prove that $2(bc\cos A + ca\cos B + ab\cos C) = a^2 + b^2 + c^2$. (5)

OR

VI. (a). Prove that $\tan A + \cot A = 2\,\mathrm{cosec}\,2A$. (5)

(b). Prove that 2tan 10+ tan 40 = tan 50. (5)

(c).Solve ΔABC given $A = 35^0$, $B = 68^0$, c = 25cm. (5)

UNIT-III

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

(b). Differentiate $x^2 \sec 3x$ (5)

(c). If $x^2+xy+y^2=0$, Find $\frac{dy}{dx}$ (5)

OR

VIII. (a). Evaluate $\lim_{x \to 0} \frac{1-cos2x}{x^2}$. (5)

(b). If $x = asec\theta, y = b\ tan\theta$ Find $\frac{dy}{dx}$. (5)

(c). Prove that $y = e^x + e^{-x}$ prove that $\frac{d^2y}{dx^2} = y.$ (5)

UNIT-IV

IX. (a). Find the equation of the tangent and normal to the curve $y = x^2 - 3x$ at (3,2). (5)

(b). The displacement of a body is given by $x = 4cos3t + 5sin3t.$ Show that the acceleration of a body is always proportional to the displacement. (5)

(c). Find the maximum volume of a cone whose slant height is $l\ cm.$ (5)

OR

X. (a). Find the velocity and acceleration of a particle at $t = 3$secs whose displacement is given by $S = 3t^3 - t^2 + 9t + 1.$ (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 the radius is 15cm. (5)

(c). Prove that a rectangle of fixed perimeter has its maximum area when it becomes a square. (5)

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