TED (15/19) 1002
(Revision – 2015/19)

**A21 – 09448**

Reg. No……
Signature …….

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2021**

# ENGINEERING MATHEMATICS – I

[Maximum Marks: 75] [Time: 2.15 Hours]

## PART-A

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

**I.** 1. Evaluate $sin30 + cos60 - \tan^2 45$.

2. If $\tan\theta = \frac{1}{2}, find\ tan2\theta$ ?

3. Find the area of a triangle having the sides a = 4cm, b=2cm and the included angle C=$30^0$.

4. Find $\lim_{\theta \to 0} \frac{\sin 5\theta}{\theta}$.

5. Find the slope of the tangent to the curve $y = \tan x$ at $x = \frac{\pi}{4}$. (3 x 2 = 6)

## PART-B

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

**II.** 1. From the top of a light house 90m high, the angles of depression of two boats on the sea level are $45^0$ and $60^0$. Find the distance between the boats.

2. Express $sinx - \sqrt{3}\cos x$ in the form K sin (x -$\alpha$).

3. Prove that $cos\ 20\ cos\ 40\ cos\ 80 = 1/8$

4. Prove that in a $\Delta ABC, (a+b)\sin\frac{c}{2} = c\cos\left(\frac{A-B}{2}\right)$

5. Differentiate '$sinx$' by the method of first principles.

6. Find $\frac{dy}{dx}\ if\ 2x^3+6xy+2y^3=16$.

7. The deflection of a beam is given by $y = 4x^3+9x^2 - 12x + 5$. Find the maximum deflection. (4 x 6 = 24)

## PART-C

(Answer ***any of the three units*** from the following. Each full question carries 15 marks)

### UNIT – I

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

(b) Prove that $\cos 120\ \sin 210 - \sin 240 \cos 330 = 1$. (5)

(c) Find the value of tan 75 without using tables and use it show that tan 75 + cot 75=4. (5)

**OR**

**IV.** (a) Prove that $\sqrt{\frac{1-sin\theta}{1+\sin\theta} + \sec\theta - \tan\theta}$. (5)

(b) If $\tan\theta = \frac{5}{12}$, θ lies in the third quadrant, find all other trigonometric functions. (5)

(b) Prove that $\sin(A+B)\sin(A-B) = cos^2B - cos^2$A. (5)

**UNIT – II**

**V.** (a) Prove that $\frac{sin3x}{sinx}$ - $\frac{cos3x}{cosx} = 2$ (5)

(b) Prove that $\frac{cos3A-cosA}{sinA-sin3A} = tan\ 2A$. (5)

(c) Solve $\Delta ABC, if\ a = 2,\ b = 3, C = 4$. (5)

**OR**

**VI**. (a) Prove that $Cosec\ 2A + Cot2A = Cot\ A$. (5)

(b) Prove that $Cos\ 55 + Cos\ 65 + Cos\ 175 = 0$ (5)

(c) Two angles of triangular plot of land are $53^0$ and $67^0$ and 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) Find i) $\lim_{x\to 3}\frac{x^3-27}{x^2-9}$ $ii)$ $\lim_{x\to\infty}\frac{x^2+x-1}{2x^{2+3x+1}}$ (6)

(b) Use quotient rule to find the derivative of tan x. (4)

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

**OR**

**VIII**. (a) Find $\frac{dy}{dx} if\ i)\ y = e^{2x}log2x$ $ii)\ y = sin^5\ (x^2)$ (6)

(b) Find $\frac{dy}{dx}\ if\ x = a\sec\theta,\ \ y = b\tan\theta$ . (4)

(c) If y =$a\cos mx + b\sin mx\ then\ show\ that\ y''\ +\ m^2y$=0. (5)

**UNIT - IV**

**IX.** (a) The distance travelled by a particle moving along a straight line after time t is given by $s = 2t^3 - 9t^2 + 12t + 6$. Find the value of t when the acceleration is zero. (5)

(b) Find the equation of the tangent and normal to the curve $y = x^2 + x - 1$ at $x=2$. (5)

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

**OR**

**X.** (a) Find the values of x for which the tangent to the curve $y = \frac{x}{x^2+1}$ will be parallel to the x axis. (5)

(b) Air is pumped into a spherical rubber bladder of radius 3 inches. If the radius increase at a uniform rate of 1 inch per minute, find the rate at which the volume is increasing at the end of 3 minutes. (5)

(c) The bending moment of a rod of length 10 m and weighing 40kg and resting at its ends at a distance of x m from one end is given by $M = 2(10 - x^2)$. Find the maximum bending moment. (5)

**********