N21-06558

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

Reg.No.....
Signature.....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/ COMMERCIAL PRACTICE - NOVEMBER-2021

ENGINEERING MATHEMATICS - I

[Maximum marks: 75] (Time: 2.15 Hours)

PART – A Marks

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

1. Prove that $(\sin A + \cos A)^2 = 1+2 \sin A \cos A$
2. If $\sin A = a$, find $\sin 3A$
3. Evaluate $\lim_{\theta \to \theta} \frac{\sin 5\theta}{\theta}$
4. Find the derivative of $e^{\sqrt{x}}$
5. Find the rate of change of volume of a sphere with respect to the radius. (3 x 2 = 6)

PART – B

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

1. Prove that $\frac{\tan\theta+sec\,\theta-1}{\tan\theta-sec\,\theta+1} = \frac{1+sin\theta}{\cos\theta}$
2. Find the value of tan 75 without using tables and show that tan 75 + cot 75 = 4
3. Solve ΔABC given a = 4cm, b = 5cm and c = 7cm
4. Differentiate x^n by the method of first principles.
5. Find $\frac{dy}{dx}$ when $x = 3\cos t - \cos^3 t$, $y = 3\sin t - \sin^3 t$
6. Show that all points on the curve $x^3 + y^3 = 3axy$ at which the tangents are parallel to the X-axis lie on the curve $ay=x^2$
7. The perimeter of a rectangle is 100cm. Find the sides when the area is maximum.

(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 $\frac{\sec\theta}{\sec\theta+1}+\frac{\sec\theta}{\sec\theta-1}=2\csc^2\theta$ (5)

(b) If $\tan\ \alpha=\frac{1}{11}, \tan\beta=\frac{5}{6}$, prove that $\alpha+\beta=45°$ (5)

(c) Prove that $\frac{\cos A-sinA}{\cos A+sinA}=\tan(45-A)$ (5)

OR

IV. (a) A rope is stretched from the top of a vertical pole to a point 6m from the foot of the pole. The rope males an angle of 60° with the horizontal. Find the height of the pole. (5)

(b) If $\sec\theta=\frac{-13}{12}$ and θ lies in the third quadrant, find all other $t-$ functions. (5)

(c) Prove that $\sin(\frac{\pi}{3}+A)-\sin\left(\frac{\pi}{3}-A\right)=\sin A$ (5)

UNIT-II

V. (a) Prove that $\frac{\sin 3A}{\sin A}+\frac{\cos 3A}{\cos A}=4\cos 2A$ (5)

(b) Prove that $\sin 20 \sin 40 \sin 60 \sin 80=\frac{3}{16}$ (5)

(c) Prove that $R(a^2+b^2+c^2)=abc(\cot A+\cot B+\cot C)$ (5)

OR

VI. (a) Solve $\Delta ABC, given\ A=35°, B=68°, C=25cm$ (5)

(b) Prove that $\sin 50-\sin 70+\sin 10=0$ (5)

(c) Prove that $2\tan 10+\tan 40=\tan 50$ (5)

UNIT-III

VII. (a) Find the derivative of cot *x* using quotient rule (5)

(b) Evaluate (*i*) $\lim\ \frac{x^3-8}{x^2-4}$ (*ii*) $\lim\theta\to\theta\ \frac{\tan 3\theta}{\theta}$ (3+2)

(c) Find $\frac{dy}{dx}$ if *(i)* $y=xe^x \sin^{-1}x$ *(ii)* $y=\log\sin(x^2+a^2)$ (5)

OR

VIII. (a) Find $\frac{dy}{dx}$ if $x=e^t\cos t, y=e^t\sin t$ (5)

(b) If $y=\sin^{-1}x$, prove that $(1-x^2)y^{II}-xy^{I}=0$ (5)

(c)Find $\frac{dy}{dx}\ if\ (i)y=\log(\sec x+\tan x)\ (ii)\ y=\frac{\cot 11x}{(x^3-1)^2}$ (5)

UNIT-IV

IX. (a) Find the values of x for which the tangent to the curve $y=2x^3-9x^2+12x-3$ is parallel to the X-axis (5)

(b) The displacement of a body is given by $x = 4\cos 3t + 5\sin 3t$. Show that the acceleration of the body is always proportional to the displacement. (5)

(c) Find the minimum value of $2x^3 - 3x^2 - 36x + 10$ (5)

OR

X (a) An open box is to be made out of a square sheet of side 8 cm by cutting off equal squares at each corner and turning up the sides. What size of the squares should be cut in order that the volume of the box may be maximum. (5)

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

(c) Find the equation of the tangent to a curve $y^2 = 4ax$ at $(a,2a)$ (5)
