TED(15)1002

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY

(Common to all Diploma Programmes except DCP & CABM)

MODEL QUESTION PAPER

Engineering Mathematics I

Max Marks: 100 Marks **Time: 3 Hrs**

PART A

(Answer all questions. 2 Marks each)

I

1. Evaluate $\sin\frac{\pi}{2}\cos\frac{\pi}{4}\tan\frac{\pi}{3}$.
2. Evaluate $\frac{\tan 15}{1+\tan^2 15}$.
3. Calculate the value of $\lim_{x\to\infty}\frac{x^2+2x+1}{x^2+x-3}$.
4. Find the derivative of $y = 3\cos x + \sqrt{x}$.
5. Find the slope of $y = \tan x$ at $x = \frac{\pi}{6}$

(5 x 2Marks = 10 Marks)

PART B

(Answer any 5 questions. 6 Marks each)

II

1. a. If $\tan A = 3$, $\tan B = 1$, A and B are acute angles find $\cos(A - B)$.
   b. Simplify $\frac{\cos(90+A)\sec(360+A)\tan(180-A)}{\sec(A-720)\sin(540+A)\cot(A-90)}$.
2. From the top of building 30 m high, angles of depressions of two cars on a road are 30^0 and 45^0. Find the distance between the cars.
3. Prove that $\frac{\sin A+\sin 3A+\sin 5A}{\cos A+\cos 3A+\cos 5A} = \tan 3A$.
4. Find $\frac{dy}{dx}$ if (i) $x = a\sec\theta, y = b\tan\theta$
   (ii) $x^2 + 3xy + y^2=1$.
5. Solve ΔABC, given $a = 87cm, b = 53cm, C = 70^0$.
6. Differentiate 'sin *x*' with respect to *x* by the method of first principles.
7. The perimeter of a rectangle is 100 m. Find the sides when the area is maximum.

(6 x 5 Marks = 30 Marks)

PART C

(Answer one full question from each unit. 15 Marks each)

Module I

III

1. If $A + B = 45^0$, Show that $(1 + tanA)(1 + tanB) = 2$. **5**
2. Express $\sqrt{3}cosx + sinx$ in the form $Rsin(x + \alpha)$. **5**
3. Prove that $Cos\ A + Cos\ \left(A + \frac{2\pi}{3}\right) + Cos\ \left(A - \frac{2\pi}{3}\right) = 0$. **5**

Or

IV 1. Prove that $\frac{sinA}{1+cosA} + \frac{1+cosA}{sinA} = 2cosecA$. **5**

2. If $cosA = \frac{3}{5}$, $tanB = \frac{5}{12}$, A lies in the fourth quadrant, B lies in the third quadrant, find values of $sin(A + B)$ and $cos\ (A + B)$. **5**

3. Find the value of $tan\ 75^0$ using addition formula and show that $tan\ 75^0 + cot75^0 = 4$. **5**

Module II

V 1. Prove that $\frac{sin3A}{sin\ A} + \frac{cos3A}{cosA} = 4cos2A$. **5**

2. Prove that $cos20^0cos40^0cos80^0 = {}^1/_8$. **5**

3. Solve ΔABC, given $a = 152cm, A = 80^0, B = 53^0$. **5**

Or

VI 1. Calculate the possible values of $cos\theta$ if $4cos2\theta + 2cos\theta + 3 = 0$. **5**

2. Show that $cos\left(\frac{\pi}{8}\right) + cos\left(\frac{3\pi}{8}\right) + cos\left(\frac{5\pi}{8}\right) + cos\left(\frac{7\pi}{8}\right) = 0$. **5**

3. Prove that $R(a^2 + b^2 + c^2) = abc(cotA + cotB + cotC)$. **5**

Module III

VII 1. Evaluate $\lim_{x\to-1}\frac{x^3+1}{x^5+1}$. **4**

2. Find $\frac{d^2y}{dx^2}$ if $y = sinxcosx$. **3**

3. If $y = log(cosecx - cotx)$, Show that $\frac{dy}{dx} = cosecx$. **4**

4. If $y = \frac{x\sin^{-1}x}{1+x^2}$ find $\frac{dy}{dx}$.

Or

VIII 1. Evaluate $\lim_{\theta\to 0}\frac{\sin 3\theta+\sin 5\theta}{2\theta}$. **4**

2. Find $\frac{dy}{dx}$ if (i) $y = \frac{e^x \sin x}{1+\log x}$

(ii) $y = \frac{1}{\sec\sqrt{x}}$. **6**

3. If $y = x^2 \sin x$, prove that $x^2y'' - 4xy' + (x^2+6)y = 0$. **5**

Module IV

IX 1. Find the equations of tangent and normal if $y = \frac{1}{3+x}$ at (-4,-1). **5**

2. The distance *S* meters travelled by a particle is given by $S = ae^{2t} + be^{-2t}$ where *t* represents the time, show that acceleration varies as the distance. **5**

3. Find the minimum value of $2x^3 - 3x^2 - 36x + 10$. **5**

Or

X 1. For what values of *x* is the tangent parallel to the curve $y = \frac{x}{(1-x)^2}$ parallel to

(i) x - axis (ii) y – axis. **5**

2. If *S* denotes the displacement of a particle at time *t* second and

$S = 2t^3 - 9t^2 + 12t + 6$

(i) find the time when the acceleration is zero.

(ii) Find the velocity at that time. **5**

3. Air is pumped into a spherical rubber bladder of radius 3 inches. If the radius increases at a uniform rate of 1 inch/minute, find the rate at which the volume is increasing at the end of 3 minutes. **5**