TED (15) – 1002
(REVISION — 2015)

Reg. No. .....
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

ENGINEERING MATHEMATICS - I

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. If $\sin \alpha = 5/13$, α is acute, find $\cos \alpha$.
2. Prove that $\sin 60 \cos 30 + \cos 60 \sin 30 = 1$.
3. In a triangle ABC, $a = 6$ cm, $b = 8$ cm and $\sin B = 3/5$. Find $\sin A$.
4. Find the derivative of $e^x + \sin^{-1} x$ with respect to x.
5. Find the rate of change of volume of a cube with respect to its side. $(5 \times 2 = 10)$

PART — B

(Maximum marks : 30)

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

1. If $A + B = 45^\circ$, prove that $(1 + \tan A)(1 + \tan B) = 2$.
2. Prove that $\cos A + \cos (A + 2\pi/3) + \cos (A - 2\pi/3) = 0$
3. Solve ΔABC, given $A = 34^\circ$, $b = 40$ cm and $c = 25$cm.
4. Show that $\sin 20 \sin 40 \sin 60 \sin 80 = 3/16$.
5. Differentiate 'cos x' by the method of first principles.
6. Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3axy$.
7. Find the equation to the tangent and normal to the curve $y = 3x^2 + x - 2$ at (1,2). $(5 \times 6 = 30)$

Marks

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Prove that $\sqrt{\frac{1+\cos A}{1-\cos A}} = \text{cosec } A + \cot A$ 5

(b) Prove that $\frac{\cos(90+A)\ \sec(360+A)\ \tan(180-A)}{\sec(A-720)\ \sin(540+A)\cot(A-90)} = 1.$ 5

(c) If $x = 3\cos\theta + 4\sin\theta$ is written in the form $x = r\sin(\theta + \alpha)$; find r. 5

OR

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

(b) If $\theta = 30°$, verify that $\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$. 5

(c) The rope supporting a flag post is fixed to the ground 20m away from the post making an angle of elevation 45° of the ground. Find the length of the rope and the height of the post. 5

UNIT — II

V (a) Prove that $\cos 4\theta = 1 - 8\sin^2\theta\cos^2\theta$. 5

(b) Prove that $\frac{\sin A + \sin 3A + \sin 5A}{\cos A + \cos 3A + \cos 5A} = \tan 3A.$ 5

(c) Find the smallest angle of triangle ABC, if a = 2cm, b = 3cm and c = 4cm. 5

OR

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

(b) Show that $\sin 33 + \cos 63 = \cos 3.$ 5

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

UNIT — III

VII (a) Evaluate $\lim_{x\to 5} \frac{x^3 - 125}{x^2 - 25}$. 5

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

(ii) $y = x^2\cos x$ (3+2)

(c) If $y = A\cos Px + B\sin Px$. Show that $\frac{d^2y}{dx^2}$ is proportional to y. 5

OR

Marks

VIII (a) Evaluate $\lim_{x \to 0} \frac{\sin mx}{\sin nx}$. 5

(b) Find $\frac{dy}{dx}$ if $y = \frac{e^x \cos x}{x^2 + \sin x}$. 5

(c) If $y = a \cos(\log x) + b \sin(\log x)$. Prove that $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = 0$. 5

UNIT — IV

IX (a) 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 of the balloon is 15cm. 5

(b) Find the range of values of x for which $x^2 - 3x + 4$ is

(i) Increasing (ii) Decreasing 5

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

OR

X (a) Find the turning values of $2x^3 - 9x^2 + 12x + 2$. 5

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

(c) An open box is to be made out of a square sheet of side 18cm 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