TED (15) 1002 **A**
(Revision -2015)

A20 - 00359

Reg. No……………………
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2020

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. $\sin\theta = 5/13$, θ is acute. Find $\cos\theta$

2. sinA = 3/5, A is acute. Find sin2A.

3. In a triangle ABC, A = 45°, B = 60°, a = 5cm. Find b.

4. Evaluate $\lim_{x\to 0}\frac{ax+b}{cx+d}$.

5. Find the slope of the curve $y = 3x^2 + x - 2$ at (1,2) (3 x 2 = 6)

PART-B

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

II 1. Express $\sqrt{3}\cos x + \sin x$ in the form $R\sin(x+\alpha)$ where α is acute.

2. Prove that $\frac{\sec\theta}{\sec\theta+1} + \frac{\sec\theta}{\sec\theta-1} = 2\text{cosec}^2\theta$

3. Show that sin10sin50sin70 = 1/8.

4. Differentiate x^n with respect to x by the method of first principles.

5. $y = x + \frac{1}{x}$. Prove that $x^2y^{II} + xy^{I} = y$

6. The displacement of a body is given by x = 3cost + 5sint. Show that acceleration varies as distance.

7. 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.

(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) 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.

(b) cosA = 3/5, tanB = 5/12. A and B are acute angles. Find sin(A+B) and cos(A-B).

(c) Prove that $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$. (3 x 5 = 15)

OR

IV (a) Prove that $\frac{1+\sin A}{\cos A} = \frac{\cos A}{1-\sin A}$

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

(c) sinA = -4/5. A lies in III quadrant. Find all other trigonometric functions. (3 x 5 = 15)

UNIT - II

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

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

(c) Solve triangle ABC, a = 4cm, b = 5cm, c = 7cm (3 x 5 = 15)

OR

VI (a) Show that sin33 + sin63 = cos3.

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

(c) Solve triangle ABC, A = 35°, B = 68°, c = 25cm (3 x 5 = 15)

UNIT- III

VII (a) $x = at^2$, $y = 2at$. Find dy/dx.

(b) Find dy/dx if $x^2 + y^2 + 2gx + 2fy + c = 0$

(c) y = asinx + bcosx. Prove that $\frac{d^2y}{dx^2} + y = 0$ (3 x 5 = 15)

OR

VIII (a) Find the derivative of cotx using quotient rule.

(b) If $y = e^x + e^{-x}$ Prove that $\frac{d^2y}{dx^2} = y$

(c) Evaluate $\lim_{x\to 3}\frac{x^3-27}{x^2-9}$ (3 x 5 = 15)

UNIT - IV

IX (a) Find the equation to the tangent and normal to the curve $y = 3x^2 + x - 2$ at (1,2)

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

(c) The distance travelled by a moving body is given by $S = 2t^3 - 9t^2 + 12t + 6$. Find the time when the acceleration is zero. (3 x 5 = 15)

OR

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

(b) Find the values of x for which the tangent to the curve $y = x^3 - 2x^2 + x + 1$ are parallel to the x-axis.

(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.

(3 x 5 = 15)
