Reg. No.	
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# FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — MARCH, 2016

## ENGINEERING MATHEMATICS - I

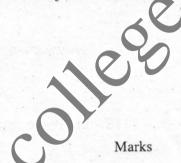
(Common to all branches except DCP and CABM)

[Time: 3 hours

(Maximum marks: 100)

PART-A

(Maximum marks: 10)

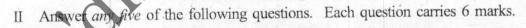


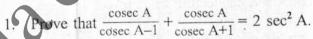
I Answer all questions. Each question carries 2 marks.

- 1. Evaluate  $\sin \frac{\pi}{2} + \csc \frac{\pi}{6} + \cot \frac{\pi}{4}$
- 2. In  $\triangle$  ABC, show that abc =  $4\triangle$ R, where  $\triangle$  is the area and R is the circum radius of the triangle.
- 3. Calculate  $\lim_{x \to \infty} \frac{7-x}{3x+1}$
- 4. Find the derivative of  $x^2 \sin x$ .
- 5. Find the range of values of x for which  $y = 2x^2 8x + 1$  is increasing. (5×2=10)

PART—B

(Maximum marks: 30)





- A person standing on the bank of a river observes that the angle of elevation of the top of a tree standing on the opposite bank is 60°. When he moves 40 meters away from the bank, he finds the angle of elevation to be 30°. Find the height of the tree and the width of the river.
- 3. Prove that  $\cos \frac{\pi}{8} + \cos \frac{3\pi}{8} + \cos \frac{5\pi}{8} + \cos \frac{7\pi}{8} = 0$ .
- 4. Solve  $\triangle$  ABC, given that a = 8 cm, b = 5 cm,  $\angle$  C = 30°.
- 5. If  $x = a (\cos t + t \sin t)$ ,  $y = a (\sin t t \cos t)$  show that  $\frac{dy}{dx} = \tan t$ .

4

4

- If  $y = a \cos (\log x) + b \sin (\log x)$ , show that  $x^2y^{11} + xy^1 + y = 0$ .
- Find the equation of tangent and normal to the curve  $x^2 + y^2 = 25$  at (3,-4). Find also the points on this curve at which the tangent is parallel to the x-axis.  $(5 \times 6 = 30)$

# PART — C

(Maximum marks: 60)

(Answer one full question from each unit. Each full question carries 15 mark

### UNIT-I

- III (a) Prove that  $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$ .
  - Simplify  $\frac{\sin (90^{\circ}+\theta) \sec (-\theta) \cot (180^{\circ}-\theta)}{\cos (270^{\circ}+\theta) \csc (180^{\circ}+\theta) \tan (90^{\circ}-\theta)}.$ 4
  - Prove that  $\sin (A + B) \sin (A B) = \sin^2 A \sin^2 A$
  - 3

- (d) If A and B are acute angles,  $\tan A = \frac{1}{2}$ ,  $\tan B = \frac{1}{3}$  show that  $A+B = \frac{\pi}{4}$ .

  IV (a) Prove that  $\sec^2 x + \csc^2 x = \sec^2 x + \csc^2 x$ .

  (b) If  $\sin A = \frac{-3}{5}$ ,  $\sin A = \frac{12}{15}$ . A lies in 3rd quadrant, B lies in second quadrant, find cos (A+B) and sin (A-B)
  - (c) Prove that  $\frac{\cos A \sin A}{\cos A + \sin A} = \tan (45^{\circ}-A)$ 4
  - (d) If  $\theta = 30^{\circ}$ , verify that  $\sin 2\theta = \frac{2 \tan \theta}{1 + \tan^2 \theta}$ 3

- Prove that  $\frac{1 + \cos 2A}{\sin 2 A} = \cot A$  and deduce the value of cot 15°. Prove that  $\sin 10^{\circ} \sin 30^{\circ} \sin 50^{\circ} \sin 70^{\circ} = \frac{1}{16}$ . 5
  - 5
  - (c) Solve  $\triangle ABC$ , given that a = 4cm, b = 5cm, c = 7cm. 5

### OR

- VI (a) If  $\sin A = \frac{3}{5}$ , A is acute, find  $\sin 2A$ ,  $\cos 2A$ ,  $\sin 3A$  and  $\cos 3A$ . 5
  - (b) Show that  $\cos 55^{\circ} + \cos 65^{\circ} + \cos 175^{\circ} = 0$ . 5
  - (c) Show that  $a(b^2 + c^2)\cos A + b(c^2 + a^2)\cos B + C(a^2 + b^2)\cos C = 3abc$ 5

Marks