TED (15/19) 1002

(Revision-2015/19)

A22 - 07435

Reg.No............................

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL-2022

ENGINEERING MATHEMATICS - I

[Maximum marks: 100] (Time: 3 Hours)

PART – A

Maximum marks : 10

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

1. Prove that $\cos^2 A - \sin^2 A = 1 - 2\sin^2 A$.
2. If $\cos A = \frac{4}{5}$ and A is acute, find $\cos 3A$
3. Find the area of the triangle ABC, given $b = 3cm$, $c = 2cm$, $A = 30^0$.
4. If $y = x \tan x$, Find $\frac{dy}{dx}$
5. Find the velocity and acceleration at time *'t'* of a particle moving according to $s = t^2 - 3t + 1$. (5 x 2 = 10)

PART – B

Maximum marks : 30

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

1. Express $4\cos\theta + 3\sin\theta$ in the form $R\sin(\theta + \alpha)$. Where α is acute.
2. Prove that $\cos 20.\cos 40.\cos 80 = \frac{1}{8}$
3. Prove that in any triangle ABC, $R(a^2 + b^2 + c^2) = abc(\cot A + \cot B + \cot C)$
4. Differentiate $\cos x$ by the method of first principles.
5. Find $\frac{dy}{dx}$ if $x^2 + y^2 = 25xy$.
6. Find the equation to the tangent and normal to the curve $x^2 + y^2 = 25$ at (3,-4).
7. Prove that $\cos 570^0 \sin 510^0 - \sin 330^0 \cos 390^0 = 0$. (5 x 6= 30)

PART – C

Maximum marks : 60

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

UNIT –I

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

(b) If sin A = $\frac{8}{17}$, sin $B = \frac{3}{5}$; A,B are acute, find sin $(A - B)$ and cos $(A + B)$ (5)

(c) From the top of a light house 90m high, the angles of depression of two boats on the sea level are 45^0 and 60^0. Find the distance between the boats. (5)

OR

IV.(a) Prove that $\frac{cosec\ A}{cosec\ A-1} + \frac{cosec\ A}{cosec\ A+1} = 2\sec^2 A$ (5)

(b) If sin A = $\frac{2}{5}$ and A is acute, find sin $2A$ and cos $2A$. (5)

(c) Show that tan 75^0 + cot 75^0 = 4 without using tables. (5)

UNIT-II

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

(b) Prove that $\sin\theta + \sin 3\theta + \sin 5\theta + \sin 7\theta = 4\cos\theta.\cos 2\theta.\sin 4\theta$. (5)

(c) Solve ΔABC, given $a = 2cm,\ b = 3cm\ and\ c = 4cm.$ (5)

OR

VI. (a) Prove that sin 50^0 – sin 70^0 + sin 10^0 = 0. (5)

(b) Prove that cos 55^0 + cos 65^0 + cos 175^0 = 0 (5)

(c) Solve ΔABC, given a = 5cm, $b = 8cm$ and $C = 30^0$. (5)

UNIT-III

VII. (a) Evaluate (i) $\lim_{x\to 0} \frac{\sin 3x.\cos x}{x}$ (ii) $\lim_{x\to\infty} \frac{3x^2-x+1}{2x^2+2x-1}$ (3+3=6)

(b) If x = a sec θ; y = b tan θ, find $\frac{dy}{dx}$ (4)

(c) If y = $Ae^{nx} + Be^{-nx}$, A,B are constants, show that $\frac{d^2y}{dx^2} - n^2y = 0$. (5)

OR

VIII.(a) Evaluate (i) $\lim_{x\to 0} \frac{1-\cos x}{x^2}$ (ii) $\lim_{x\to 1} \frac{x^3-1}{x-1}$ (4+2 = 6)

(b) If $y = \log(\sec x - \tan x)$, show that $\frac{dy}{dx} = -\sec x$. (4)

(c) If $y = a\sin mx$, Prove that $\frac{d^2y}{dx^2} + m^2y = 0$ (5)

UNIT-IV

IX. (a) Find the equations of tangent and normal to the curve $y = 3\,x^2 + x + 2$ at (1,2). (5)

(b) A circular patch of oil spreads out on water, the area is growing at the rate of $6cm^2$ per minute. How fast is the radius increasing when the radius is 2 cms? (5)

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

OR

X. (a) The distance travelled by a particle moving along a straight line is given by $S = 2t^3 - 9t^2 + 12t + 6$. Find the value of 't' when the acceleration is zero. (5)

(b) The radius of a circular plate is increasing in length at 0.1 cm/sec when heated. What is the rate at which the area is increasing when the radius is 12 cm. (5)

(c) The deflection of a beam is given by $y = 2x^3 - 9x^2 + 12\,x$, find the maximum deflection. (5)

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