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TED (15) – 1002

(REVISION - 2015)

Reg. No.

Signature

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2017

ENGINEERING MATHEMATICS – I

[Time: 3 hours

(Maximum marks : 100)

PART — A (Maximum marks : 10)

Marks

I Answer all questions. Each question carries 2 marks.

1. Prove that $(1 + \cos A) (1 - \cos A) = \sin^2 A$

2. Find the value of 3sin15° - 4sin³15°

3. Find $\frac{dy}{dx}$ if $y = x^3 \tan x$.

4. Find the rate of change of volume V with respect to the side of a cube.

5. Find the area of triangle ABC given B = 3cm, C = 2cm and $A = 30^{\circ}$

 $(5 \times 2 = 10)$

 $(5 \times 6 = 30)$

PART - B

(Maximum marks : 30)

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

- 1. Prove that $\left(\frac{\tan\theta + \sec\theta 1}{\tan\theta \sec\theta + 1}\right) = \frac{1 + \sin\theta}{\cos\theta}$
- 2. If $\tan A = \frac{m}{m+1}$, $\tan B = \frac{1}{2m+1}$ A and B are acute angles. Prove that $A + B = 45^{\circ}$
- 3. Prove that sin 20°. sin 40°. sin 80° = $\frac{\sqrt{3}}{8}$
- 4. Prove that R $(a^2 + b^2 + c^2) = abc$ (cotA + cotB + cotC) where R is radius of circumcircle.
- 5. Differentiate xⁿ by method of first principles.
- 6. A particle moves such that the displacement from a fixed point 'o' is always given by $S = 5\cos(nt) + 4\sin(nt)$ where n is a constant. Prove that the acceleration varies as its displacement S at the instant.
- 7. Find the equation to the tangent and normal to the curve $y = 3x^2 + x-2$ at (1,2).

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Marks

5

PART — C

(Maximum marks : 60)

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

Unit — I

III (a) Prove that
$$\left(\frac{1+\sin A}{\cos A}\right) = \left(\frac{\cos A}{1-\sin A}\right)$$
 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 $\sin A = \frac{-4}{5}$ and A lies in third quadrant, find all other trigonometric functions.

OR

IV	(a)	If $\cos A = 3/5$, $\tan B = 5/12$, A and B are acute angles, find the values of $\sin (A + B)$ and $\cos (A-B)$.	6
	(b)	Prove that $\frac{\tan 45 - \tan 30}{1 + \tan 45 \tan 30} = 2 - \sqrt{3}$	4
	(c)	Express 5 sinx – 12 cosx in the form Rsin $(x - \infty)$	5
		Unit — II	
V	(a)	Prove that $\sin 33 + \cos 63 = \cos 3$	5
	(b)	Show that (a-b) $\cos \frac{C}{2} = c \sin \frac{A-B}{2}$	5
	(c)	Solve triangle ABC, given $a = 2 \text{ cm } b = 3 \text{ cm } c = 4 \text{ cm}$	5
		OR OR	
VI	(a)	Prove that $\cos \frac{\pi}{8} + \cos \frac{3\pi}{8} + \cos \frac{5\pi}{8} + \cos \frac{7\pi}{8} = 0$	5
	(b)	Prove that 2 [bccosA+cacosB+abcosC] = $a^2+b^2+c^2$	5
	(c)	Two angles of a triangular plot of land are 53°17' and 67°9' and the side between them is measured to be 150m. How many metres of fencing is	
		required to fence the plot ?	5
		Unit — III	
/11	(a)	Evaluate Lt $\sqrt{(1+x)^{-1}}$ x	4
	(b)	Find $\frac{dy}{dx}$, if (i) $y = \frac{\cot 11x}{(x^3 - 1)^2}$ (ii) $(x^2 + 1)^{10} \sec^5 x$ (3)	(+3)
	(c)	If $x = a(\theta + \sin\theta) y = a(1 - \cos\theta)$ find $\frac{dy}{dx}$	5
		2	×.

OR

Marks

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- VIII (a) Find the derivative of cotx using quotient rule.
 - (b) If $y = \sin^{-1} x$ prove that $(1-x^2) \frac{d^2 y}{dx^2} x \frac{dy}{dx} = 0$
 - (c) If x and y are connected by the relation $ax^2 + 2hxy + by^2 = 0$ find $\frac{dy}{dx}$.
 - UNIT IV
 - IX (a) Show that all the points on the curve $x^3 + y^3 = 3axy$ at which the tangents are parallel to the x-axis lie on the curve, $ay = x^2$.
 - (b) 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 15 cm.
 - (c) The deflection of a beam is given by $y = 4x^3 + 9x^2 12x + 2$. Find the maximum deflection.

OR

- X (a) Prove that a rectangle of fixed perimeter has its maximum area when it becomes a square.
 - (b) A circular patch of oil spreads out on water, the area growing at the rate of 6 sq.cm per minute. How fast is the radius increasing when the radius is 2cms.?
 - (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.

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