

TED (15) - 1002

(REVISION - 2015)

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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 $3\sin 15^{\circ} 4\sin^3 15^{\circ}$
 - 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 $A = 30^{\circ}$

 $(5 \times 2 = 10)$

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 $\sin 20^{\circ} \cdot \sin 40^{\circ} \cdot \sin 80^{\circ} = \frac{\sqrt{3}}{8}$
 - 4. Prove that R $(a^2 + b^2 + c^2)$ = abc $(\cot A + \cot B + \cot C)$ 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).

 $(5 \times 6 = 30)$



Marks

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 $\cos(A-B)$.

(b) Prove that $\frac{\tan 45 - \tan 30}{1+\tan 45\tan 30} = 2 - \sqrt{3}$ 4

(c) Express $5 \sin x - 12 \cos x$ in the form $R\sin(x-\infty)$ 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 $a = 2 \cos b = 3 \cos c = 4 \cos b$ 7

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 $2 [b \cos A + \cos B + a b \cos C] = a^2 + b^2 + c^2$ 5

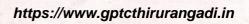
(c) Two angles of a triangular plot of land are $53^\circ 17'$ and $67^\circ 9'$ and the side between them is measured to be $150 \cos B$. How many metres of fencing is required to fence the plot ?

UNIT - III

VII (a) Evaluate Lt
$$\frac{\sqrt{(1+x)-1}}{x \to 0}$$
 4

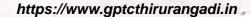
(b) Find $\frac{dy}{dx}$, if (i) $y = \frac{\cot 11x}{(x^3-1)^2}$ (ii) $(x^2+1)^{10} \sec^5 x$ (3+3)

(c) If
$$x = a(\theta + \sin\theta) y = a(1 - \cos\theta)$$
 find $\frac{dy}{dx}$





			Marks
VIII	(a)	Find the derivative of cotx using quotient rule.	5
	(b)	If $y = \sin^{-1} x$ prove that $(1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} = 0$	5
	(c)	If x and y are connected by the relation $ax^2 + 2hxy + by^2 = 0$ find $\frac{dy}{dx}$.	5
		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, $ay = x^2$.	. 5
	(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.	5
	(c)	The deflection of a beam is given by $y = 4x^3 + 9x^2 - 12x + 2$. Find the maximum deflection.	n 5.
		O _R	
	(a)	Prove that a rectangle of fixed perimeter has its maximum area when it becomes a square.	5
	(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.?	5
	(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.	5



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