



N19 - A0101

TED (15) – 1002

Reg. No.....

(REVISION — 2015)

Signature

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2019

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 $\cos^2 A - \sin^2 A = 2 \cos^2 A - 1$.

2. Write the expression for $\sin 3A$.

3. Prove that in any triangle ABC, $abc = 4R\Delta$.

4. If $y = x \sin x$, Find $\frac{dy}{dx}$

5. Find the velocity and acceleration at time 't' of a particle moving according to
 $s = 2t^3 - 3t^2 + 1$.

(5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Express $4 \cos x + 3 \sin x$ in the form $R \sin(x + \alpha)$ where α is acute.

2. Prove that $\sin 10^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{8}$.

3. Prove that $(a - b) \cos \frac{C}{2} = c \sin \frac{A-B}{2}$.

4. Differentiate $\sin x$ by the method of first principles.

5. Find $\frac{dy}{dx}$ if $(x^2 + y^2)^2 = xy$.

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

7. Prove that $\sin A + \sin(120^\circ + A) + \sin(240^\circ + A) = 0$.

(5×6 = 30)



PART — C

Marks

(Maximum marks : 60)

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

UNIT — I

- III (a) Prove that $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2 \operatorname{cosec} \theta.$ 5
- (b) If θ is acute and $\sin \theta = 0.4$, find the value of $\sec \theta + \tan \theta.$ 5
- (c) If $A + B = 45^\circ$, show that $(1 + \tan A)(1 + \tan B) = 2.$ 5

OR

- IV (a) Prove that $\frac{1+\cos\theta}{\sin\theta} = \frac{\sin\theta}{1-\cos\theta}.$ 5
- (b) If $\sin A = \frac{4}{5}$, $\sin B = \frac{12}{13}$; A, B are acute, find $\sin(A + B)$ and $\cos(A - B).$ 5
- (c) The horizontal distance between two towers is 60m and the angle of depression of the first tower as seen from the second which is in 150m height is $30^\circ.$ 5
Find the height of the first tower.

UNIT — II

- V (a) Prove that $\frac{\sin 3A}{\sin A} - \frac{\cos 3A}{\cos A} = 2.$ 5
- (b) Prove that $\tan A + \cot A = 2\operatorname{cosec} 2A.$ 5
- (c) Show that $\frac{\sin 2A}{1+\cos 2A} = \tan A$ and deduce the value of $\tan 15^\circ.$ 5

OR

- VI (a) Prove that $\frac{\sin A + \sin 3A + \sin 5A}{\cos A + \cos 3A + \cos 5A} = \tan 3A$ 5
- (b) Prove that $\sin A + \sin 3A + \sin 5A + \sin 7A = 4 \cos A \cos 2A \sin 4A.$ 5
- (c) Solve ΔABC , given $a = 4\text{cm}$, $b = 5\text{cm}$ and $c = 7\text{cm}.$ 5

UNIT — III

- VII (a) Evaluate $\lim_{x \rightarrow 4} \frac{x^4 - 256}{x^3 - 64}.$ 5
- (b) If $x = a(\theta - \sin \theta)$; $y = a(1 - \cos \theta)$, show that $\frac{dy}{dx} = \cot \frac{\theta}{2}$ 5
- (c) If $y = A \cos px + B \sin px$, (A, B, p are constants), Show that $\frac{d^2y}{dx^2}$ is proportional to $y.$ 5

OR



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| VIII | (a) Evaluate (i) $\lim_{x \rightarrow 0} \frac{1 - \cos 2x}{x^2}$ (ii) $\lim_{x \rightarrow -1} \frac{x^3 + 1}{x + 1}$ | (3+3=6) |
| | (b) Find $\frac{dy}{dx}$ if $y = (x^2 + x + 1)^7 \sin^2 x$. | 4 |
| | (c) If $y = Ae^{nx} + Be^{-nx}$ (A, B are constants), Show that $\frac{d^2y}{dx^2} - n^2y = 0$. | 5 |

UNIT — IV

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| IX | (a) A particle is projected vertically upwards and its height 'h' and time 't' are connected by $h = 60t - t^2$. Find the greatest height attained. | 5 |
| | (b) A balloon is spherical in shape. Gas is escaping from it at the rate of 10cc/sec. How fast is the surface area shrinking when the radius is 15cm. | 5 |
| | (c) The deflection of a beam is $S = 2x^3 - 9x^2 + 12x$. Find the maximum deflection. | 5 |

OR

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|---|--|---|
| X | (a) Find the velocity and acceleration of a particle at $t = 3$ seconds whose displacement is given by $S = 3t^3 - t^2 + 9t + 1$. | 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 15cm. | 5 |
| | (c) Find the maximum value of $2x^3 - 3x^2 - 36x + 10$. | 5 |
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