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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

ENGINEERING MATHEMATICS - I

[Time : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. If $\sin \alpha = 5/13$, α is acute, find $\cos \alpha$.
2. Prove that $\sin 60 \cos 30 + \cos 60 \sin 30 = 1$.
3. In a triangle ABC, $a = 6$ cm, $b = 8$ cm and $\sin B = 3/5$. Find $\sin A$.
4. Find the derivative of $e^x + \sin^{-1} x$ with respect to x .
5. Find the rate of change of volume of a cube with respect to its side. $(5 \times 2 = 10)$

PART — B

(Maximum marks : 30)

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

1. If $A + B = 45^\circ$, prove that $(1 + \tan A)(1 + \tan B) = 2$.
2. Prove that $\cos A + \cos (A + 2\pi/3) + \cos (A - 2\pi/3) = 0$
3. Solve ΔABC , given $A = 34^\circ$, $b = 40$ cm and $c = 25$ cm.
4. Show that $\sin 20 \sin 40 \sin 60 \sin 80 = 3/16$.
5. Differentiate 'cos x' by the method of first principles.
6. Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3axy$.
7. Find the equation to the tangent and normal to the curve $y = 3x^2 + x - 2$ at $(1, 2)$. $(5 \times 6 = 30)$

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Prove that $\sqrt{\frac{1+\cos A}{1-\cos A}} = \operatorname{cosec} A + \cot A$ 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 $x = 3 \cos \theta + 4 \sin \theta$ is written in the form $x = r \sin(\theta + \alpha)$; find r . 5

OR

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

(b) If $\theta = 30^\circ$, verify that $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$. 5

(c) The rope supporting a flag post is fixed to the ground 20m away from the post making an angle of elevation 45° of the ground. Find the length of the rope and the height of the post. 5

UNIT — II

V (a) Prove that $\cos 4\theta = 1 - 8 \sin^2 \theta \cos^2 \theta$. 5

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

(c) Find the smallest angle of triangle ABC, if $a = 2\text{cm}$, $b = 3\text{cm}$ and $c = 4\text{cm}$. 5

OR

VI (a) Prove that $\frac{\sin 3A}{\sin A} + \frac{\cos 3A}{\cos A} = 4 \cos 2A$. 5

(b) Show that $\sin 33 + \cos 63 = \cos 3$. 5

(c) Prove that $R(a^2 + b^2 + c^2) = abc (\cot A + \cot B + \cot C)$ 5

UNIT — III

VII (a) Evaluate $\lim_{x \rightarrow 5} \frac{x^3 - 125}{x^2 - 25}$. 5

(b) Find $\frac{dy}{dx}$ if (i) $x = a \sec \theta$, $y = b \tan \theta$.

(ii) $y = x^2 \cos x$ (3+2)

(c) If $y = A \cos Px + B \sin Px$. Show that $\frac{d^2y}{dx^2}$ is proportional to y . 5

OR

