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(REVISION — 2015)

Reg. No. ....

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

ENGINEERING MATHEMATICS - II

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I   Answer *all* questions. Each question carries 2 marks.

1. Find the length of the vector $3\hat{i} + 4\hat{j} + \hat{k}$

2. If $\begin{vmatrix} x^2 & 3 \\ 4 & 1 \end{vmatrix} = \begin{vmatrix} 9 & 4 \\ 8 & 5 \end{vmatrix}$ find x.

3. $A \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -2 \\ -3 & -3 \end{bmatrix}$, find $(A + B)^T$.

4. Find $\int (3x^2 - 2x + 1)\, dx$.

5. Solve : $\dfrac{dy}{dx} = ky$.

(5 × 2 = 10)

PART — B

(Maximum marks : 30)

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

1. If $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{b} = 3\hat{i} + 4\hat{j} + 2\hat{k}$.

    Calculate   (i) $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b})$ (ii) $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$

2. Find the coefficient of x^{32} in the expansion of $\left(x^4 - \dfrac{1}{x^3} \right)^{15}$.

3. Solve the following system of equations using determinants :

    $x + 2y - z = -3$, $3x + y + z = 4$, $x - y + 2z = 6$

4. Express the matrix $A = \begin{bmatrix} 1 & 4 & 5 \\ 2 & 2 & 3 \\ 3 & 1 & 0 \end{bmatrix}$, as the sum of a symmetric and skew symmetric matrices.

[12]

Marks

5. Evaluate $\int_0^{\frac{\pi}{2}} sin3x\ cosx\ dx$.

6. Find the volume of a sphere of radius r using integration.

7. Solve : $\frac{dy}{dx} + y\ tanx = cosx$. $(5 \times 6 = 30)$

PART — C

(Maximum marks : 60)

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

UNIT — I

III   (a)   Find the dot product and angle between the vectors $\hat{i} - 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$ 5

     (b)   Find the moment of a force represented by $\hat{i} + \hat{j} + \hat{k}$ acting through the point $-2\hat{i} + 3\hat{j} + \hat{k}$ about the point $\hat{i} + 2\hat{j} + 3\hat{k}$.   5

     (c)   Find the middle term(s) in the expansion of $\left(2x + \frac{1}{x}\right)^9$.   5

OR

IV   (a)   If $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = -\hat{i} + 3\hat{j} + 2\hat{k}$ find the unit vector in the direction of the vector $3\vec{a} + 4\vec{b}$ 5

     (b)   Find the work done by the force $\vec{F} = \hat{i} + 2\hat{j} + \hat{k}$ acting on a particle which is displaced from the point with position vector $2\hat{i} + \hat{j} + \hat{k}$ to the point with position vector $3\hat{i} + 2\hat{j} + 4\hat{k}$.   5

     (c)   Expand $\left(x^3 - \frac{1}{x^2}\right)^5$ using binomial theorem.   5

UNIT — II

V   (a)   Find the inverse of $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$.   5

     (b)   If $A = \begin{bmatrix} 3 & 1 & -1 \\ 0 & 1 & 2 \end{bmatrix}$ show that $A.A^T$ is symmetric.   5

     (c)   Solve : $\frac{5}{x} + \frac{2}{y} = 4$; $\frac{2}{x} - \frac{1}{y} = 7$.   5

OR

VI   (a)   Solve for x if $\begin{vmatrix} 3 & 1 & 9 \\ 2x & 2 & 6 \\ x^2 & 3 & 3 \end{vmatrix} = 0$.   5

     (b)   If $A = \begin{bmatrix} 1 & 2 & 3 \\ -4 & 5 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ -1 & 1 \end{bmatrix}$. Find AB and BA. Prove that AB ≠ BA   5

     (c)   Find A and B if $A + B = \begin{bmatrix} 4 & 6 \\ 2 & 3 \end{bmatrix}$ and $A - B = \begin{bmatrix} -2 & 8 \\ 4 & -1 \end{bmatrix}$.   5

Marks

VII   (a) Evaluate (i) $\int sin^2\ xdx$ (ii) $\int \frac{x^2+2}{x}\ dx$.   (3 + 2 = 5)

    (b) Evaluate $\int_{0}^{\frac{\pi}{2}} \sqrt{1+sin2x}\ dx$.   5

    (c) Evaluate $\int x^2\ log\ xdx$.   5

Or

VIII   (a) Evaluate (i) $\int \frac{sec^2\ x}{\sqrt{1-tan^2x}}\ dx$ (ii) $\int sinx + \frac{1}{x} + cosec^2xdx$.   (3 + 2 = 5)

    (b) Evaluate $\int \frac{2x^4}{1+x^{10}}\ dx$.   5

    (c) Evaluate $\int_{0}^{1} \frac{1-2x}{x^2-x+1}\ dx$.   5

IX   (a) Find the area enclosed by the curve $y = x^2$ and the straight line $y = 3x + 4$.   5

    (b) Find the volume of the solid obtained by rotating one arch of the curve $y = sinx$ about the x – axis.   5

    (c) Solve : $(x^2 + 1)\frac{dy}{dx} + 2xy = 4x^2$.   5

Or

X   (a) Find the area enclosed between the parabola $y = x^2 - x - 2$ and the x – axis.   5

    (b) Solve : $\frac{d^2y}{dx^2} = cosec^2\ x$.   5

    (c) Solve : $x(1 + y^2)dx + y(1 + x^2)\ dy = 0$.   5