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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 : $\frac{dy}{dx} = ky$. (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) $(\vec{a} + \vec{b}).(\vec{a} - \vec{b})$ (ii) $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$
2. Find the coefficient of x^{32} in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$.
3. Solve the following system of equations using determinants :

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

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 × 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 $\left(2x + \frac{3}{x}\right)^9$. 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 $\begin{vmatrix} 3 & 1 & 9 \\ 2x & 2 & 6 \\ x2 & 3 & 3 \end{vmatrix} = 0.$ 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

UNIT — III

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

(b) Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{1 + \sin 2x}\, dx$. 5

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

OR

VIII (a) Evaluate (i) $\int \frac{\sec^2 x}{\sqrt{1 - \tan^2 x}} dx$ (ii) $\int \sin x + \frac{1}{x} + \operatorname{cosec}^2 x dx$. (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

UNIT — IV

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 $y = \sin x$ 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 : $\frac{d^2y}{dx^2} = \operatorname{cosec}^2 x$. 5

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