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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER 2018

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 a unit vector in the direction of the vector $2\bar{i} + \bar{j} - 2\bar{k}$.

2. Evaluate $\begin{vmatrix} 1 & 2 & -1 \\ 2 & 0 & 3 \\ -2 & -4 & 2 \end{vmatrix}$

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

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

5. Solve $\dfrac{d^2y}{dx^2} = \sin x$ (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. The constant forces $2\bar{i} - 5\bar{j} + 6\bar{k}$, $-\bar{i} + 2\bar{j} - \bar{k}$ and $2\bar{i} + 7\bar{j}$ act on a Particle such that the particle is displaced from the position $4\bar{i} - 3\bar{j} - 2\bar{k}$ to $6\bar{i} + \bar{j} - 3\bar{k}$. Find the total work done.

2. Find the term indipendant of x in the expansion of $\left(3x^2 - \dfrac{1}{2x^3}\right)^{10}$

3. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$, find $A^2 - 5A + 6I$

4. Find the inverse of the matrix $\begin{bmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix}$

Marks

5. Evaluate $\int_0^{\pi/8} \sin x \sin 3x \, dx$.

6. Find the area of a circle of radius 'r' units using integration.

7. Solve : $x(1 + y^2)\,dx + y(1 + x^2)\,dy = 0$ (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 angle between the vectors $\bar{i} - 2\bar{j} + 3\bar{k}$ and $3\bar{i} - 2\bar{j} + \bar{k}$ 5

(b) Find the value of λ for which the vectors $3\bar{i} + 2\bar{j} + 9\bar{k}$ and $\bar{i} + \lambda\bar{j} + 3\bar{k}$ are parallel. 5

(c) Find the 10^{th} term in the expansion of $\left(x^2 - \frac{1}{x^2}\right)^{20}$ 5

OR

IV (a) Find $\bar{a} \times \bar{b}$ if

$\bar{a} = 2\bar{i} + 3\bar{j} + 6\bar{k}$,

$\bar{b} = 3\bar{i} - 6\bar{j} + 2\bar{k}$ 5

(b) If $\bar{a} = 5\bar{i} - \bar{j} - 3\bar{k}$ and $\bar{b} = \bar{i} + 3\bar{j} - 5\bar{k}$ show that $\bar{a} + \bar{b}$ and $\bar{a} - \bar{b}$ are perpendicular. 5

(c) Expand $(2x + 3y)^4$ using binomial theorem. 5

UNIT — II

V (a) Solve for 'x' if $\begin{vmatrix} 2x-1 & x+1 \\ x+2 & x-2 \end{vmatrix} = 0$ 5

(b) 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

(c) If A $\begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & -1 \\ 3 & 0 & 1 \end{bmatrix}$ Evaluate A^3 5

OR

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Marks

VI (a) Solve using determinants $\frac{5}{x} + \frac{2}{y} = 4, \quad \frac{2}{x} - \frac{1}{y} = 7$ 5

(b) For the matrices given below, compute AB and BA and show that AB ≠ BA

$$A = \begin{bmatrix} 1 & 2 & 3 \\ -4 & 5 & -1 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ -1 & 1 \end{bmatrix}$$
5

(c) Find the adjoint of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & -3 \\ -1 & 2 & 3 \end{bmatrix}$ 5

UNIT — III

VII (a) Evaluate $\int \frac{3\cos x + 4}{\sin^2 x} dx$ 5

(b) Evaluate $\int \frac{1}{x \log x} dx$ 5

(c) Evaluate $\int_0^{\pi/2} x \sin x \, dx$ 5

OR

VIII (a) Evaluate $\int \sin^3 x \cos x \, dx$ 5

(b) Evaluate $\int x^2 e^{-x} dx$ 5

(c) Evaluate $\int_0^1 \frac{2x+1}{x^2+x+1} dx$ 5

UNIT — IV

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

(b) Find the volume generated by rotating the area bounded by $y = 2x^2 + 1$, the Y - axis and the lines $y = 3$, $y = 9$ about the Y-axis. 5

(c) Solve $x \frac{dy}{dx} + 3y = 5x^2$ 5

OR

X (a) Find the volume of a sphere of radius 'r' using integration. 5

(b) Solve $\frac{dy}{dx} = (1 + x)(1 + y^2)$ 5

(c) Solve $\frac{dy}{dx} + \frac{x\sqrt{1+y^2}}{y\sqrt{1+x^2}} = 0$ 5

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