TED (15) 2002 | A21-00685 | Reg.No.............................

(Revision-2015/19) | Signature.........................

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL-2021

ENGINEERING MATHEMATICS - II

[Maximum marks: 75] (Time: 2.15 Hours)

PART – A

I (Answer any *three* questions. Each question carries 2 marks)

1. If $\vec{a} = \hat{\imath} + \hat{\jmath} + \hat{k}$, $\vec{b} = 2\hat{\imath} - \hat{\jmath} + 3\hat{k}$, find $\vec{a}.\ \vec{b}$.
2. If $\begin{vmatrix} 3x & 7 \\ 2 & 3 \end{vmatrix} = 0$ find x.
3. If $A - \begin{bmatrix} 3 & 5 \\ 2 & 7 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ find A.
4. Evaluate $\int_0^1 xe^x\ dx$.
5. Solve $\frac{dy}{dx} = 5$.

(3 x 2 = 6)

PART – B

II (Answer any *four* of the following questions. Each question carries 6 marks)

1. Find the area of the triangle whose vertices are $A(\hat{\imath} - \hat{k})$, $B(2\hat{\imath} + \hat{\jmath} + 5\hat{k})$ and $C(\hat{\jmath} + 2\hat{k})$.
2. Find the constant term in the expansion of $(x^2 - \frac{1}{x})^9$.
3. Solve the following equations using determinants.
   $x + y - 4z = -8$, $-4x + y + z = 2$, $x - 4y + z = -3$.
4. If $A = \begin{bmatrix} 3 & 1 & 2 \\ -1 & 2 & 3 \\ 2 & -5 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 & 1 \\ 3 & -1 & 2 \\ 4 & 1 & 3 \end{bmatrix}$ be two matrices. Compute the product AB and BA. Do AB and BA commute?
5. Evaluate $\int_0^{\frac{\pi}{2}} sin3x\ cosx\ dx$.

6. Find the area enclosed between the curve $y = x^2$ and the straight line $y = 3x + 4$.

7. Solve $(1 + x^2)\frac{dy}{dx} + y = e^{tan^{-1}x}$.

(4 x 6= 24)

PART – C

(Answer *any of the three units* from the following. Each full question carries 15 marks)

UNIT - I

III (a) Find the value of λ so that the two vectors $2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ and $4\hat{\imath} + 6\hat{\jmath} - \lambda\,\hat{k}$ are parallel. 5

(b) A particle acted on by two forces $4\,\hat{\imath} + \hat{\jmath} - 3\hat{k}$ and $3\hat{\imath} + \hat{\jmath} - \hat{k}$ is displaced from the point $\hat{\imath} + 2\hat{\jmath} + \hat{k}$ to the point $5\hat{\imath} + 4\hat{\jmath} + \hat{k}$. Find the total work done by the forces. 5

(c) Find the middle term(s) in the expansion of $(3x - \frac{x^3}{6})^7$. 5

OR

IV (a) If $\vec{a} = 5\hat{\imath} - \hat{\jmath} - 3\hat{k}$, $\vec{b} = \hat{\imath} + 3\hat{\jmath} - 5\hat{k}$ show that the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular to each other. 5

(b) A force $\vec{F} = 4\hat{\imath} - 3\hat{k}$ passes through the point 'A' whose position vector is $2\hat{\imath} - 2\hat{\jmath} + 5\hat{k}$. Find the moment of the force about the point 'B' whose position vector is $\hat{\imath} - 3\hat{\jmath} + \hat{k}$. 5

(c) Expand $(3a + 2b)^4$ binomially. 5

UNIT - II

V (a) Solve $\frac{2}{x} + \frac{3}{y} = 5$, $\frac{2}{x} + \frac{5}{y} = 3$ using determinants. 5

(b) If $A(\theta) = \begin{bmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{bmatrix}$ show that $A(\theta)A(\theta') = A(\theta + \theta')$. 5

(c) Find the adjoint of the matrix $= \begin{bmatrix} 1 & 1 & 3 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ 5

OR

VI (a) If $\begin{vmatrix} 2 & 1 & x \\ 3 & -1 & 2 \\ 1 & 1 & 6 \end{vmatrix} = \begin{vmatrix} 4 & x \\ 3 & 2 \end{vmatrix}$, find x. 5

(b) If $A = \begin{bmatrix} 1 & 0 & 5 \\ -2 & 1 & 6 \\ 3 & 2 & 7 \end{bmatrix}$ compute $A + A^T$. Show that $A + A^T$ is symmetric. 5

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

UNIT - III

VII (a) Evaluate $\int cosecx\, dx$. 5

(b) Evaluate $\int \frac{x^7}{(1+x^8)^3} dx$. 5

(c) Evaluate $\int_0^{\pi} \frac{1}{1+sinx} dx$. 5

OR

VIII (a) Evaluate $\int \frac{cosx}{\sqrt{sinx}} dx$. 5

(b) Evaluate $\int x^3 logx\ dx$. 5

(c) Evaluate $\int_0^2 x^2(x^3+1)\ dx$. 5

UNIT - IV

IX (a) Find the area enclosed by one arch of the curve $y = 3\, sin2x$ and the x-axis. 5

(b) Find the volume of the solid generated by the rotation of the area bounded by the curve $y = 2\, cosx$, the x-axis and the lines $x = 0$, $x = \frac{\pi}{4}$ about the x-axis. 5

(c) Solve $\frac{dy}{dx} = 4x - 7$. (Given y = 3 when x = 1) . 5

OR

X (a) Find the volume of a right circular cone of height 'h' and base radius ' r ' using integration. 5

(b) Solve $dx\,(1+y^2) = dy\,(1+x^2)$. 5

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

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