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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL UNIVERSITY, MANIPAL - 576 104

SECOND SEMESTER B.E DEGREE END SEMESTER EXAMINATION – 2008

SUB: ENGINEERING MATHEMATICS II (MAT –102)
(REVISED CREDIT SYSTEM)

Time : 3 Hrs. **Max.Marks : 50**

✍ **Note : a) Answer any FIVE full questions.**
b) All questions carry equal marks.

1A. Expand $f(x, y) = e^x \log(1 + y)$ up to third degree terms as a Maclurin's series.

1B. Reverse the order of integration and evaluate $\int_0^2 \int_{y^2/4}^{3-y} (x^2 + y^2)\,dx\,dy$

1C. Define an orthonormal basis.
Show that a set of nonzero orthogonal vectors are linearly independent.

(3 + 4+ 3)

2A. Find the extreme values of $xy(a - x - y)$.

2B. Find by double integration, the area lying between the parabola $y = 4x - x^2$ and line $y = x$.

2C. Test whether the following vectors form a basis $(1, 0, 1), (0, 1, 1), (1, -1, 3)$ if so, express $(1, 2, 3)$ in terms of basis vectors.

(4 + 3+ 3)

3A. Solve : $y(x + y + 1)\,dx + x(x + 3y + 2)\,dy = 0$

3B. Find the volume bounded by the paraboloid $x^2 + y^2 = az$, the cylinder $x^2 + y^2 = 2ay$ and the plane $z = 0$.

3C. Solve by Gauss Elimination method

$$4x - 5y + z = -3$$
$$2x + 3y - z = 3$$
$$3x - y + 2z = 5$$
$$x + 2y - 5z = -9$$

(3 + 4 + 3)

P.T.O

4A. Solve $6y^2\,dx - x\,(2x^3 + y)\,dy = 0$.

4B. Find :

(i) $L\{ t\,e^{3t} \sin 2t \}$ (ii) $L^{-1}\left\{\log \frac{s}{\sqrt{s^2+4}}\right\}$

4C. Find the inverse of

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

by elementary row transformations.

(3 + 4+ 3)

5A. Solve : $y'' - 2y' + y = xe^x \sin x$

5B. Find the Laplace transform of

$$F(t) = \begin{cases} E\sin \omega t, & 0 \le t < \pi/\omega \\ 0, & \pi/\omega \le t < 2\pi/\omega \end{cases}$$

and $F\left(t + 2\pi/\omega\right) = F(t)$

5C. Solve by Laplace transform method

$x''(t) + 2x'(t) + x(t) = 3te^{-t}$ with x (0) = 4 , $x'(0) = 2$

(4 + 3+ 3)

6A. Solve : $(D^2 - 2D + 1)\,y = e^{2x}(e^x + 1)^{-2}$.

6B. Solve :

$$\frac{dx}{dt} + 5x - 2y = t$$
$$\frac{dy}{dt} + 2x + y = 0$$

6C. Evaluate the following using Beta and Gamma functions

(i) $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$ (ii) $\int_0^{\pi/2} \sqrt{\tan\theta}\, d\theta$

(4 + 3+ 3)

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