Reg.No										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL UNIVERSITY, MANIPAL - 576 104

SECOND SEMESTER B.E DEGREE END SEMESTER EXAMINATION – May, 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. Solve : $(x^2 \sin^3 y - y^2 \cos x)dx + \left(x^3 \cos y \sin^2 y - 2y \sin x\right)dy = 0$

1B. Reverse the order of integration and evaluate

$$\int_{x=0}^{a/\sqrt{2}} \int_{y=x}^{\sqrt{a^2-x^2}} y^2 dy dx$$

1C. If $S = \{u_1, u_2, \ldots, u_n\}$ be a linearly independent set of vectors in a vector space V. Let $v \in V$ is such that v can not be expressed as a linear combination of vectors of S. Then show that $S \cup \{v\}$ is also linearly independent set. Hence show that every maximal linearly independent set of vectors in V forms a basis of V. (3 + 3+ 4)

2A. Solve :
$y'' - 4y' + 4y = e^{2x} + \sin 2x + x^2$

2B. Find the area common to $x^2 + y^2 = a^2$ and $x^2 + y^2 = 2ax$.

2C. Use Gram – Schmidt orthogonalization process to find an orthonormal basis of E^3 from the vectors {(1,0,1), (0, 1, 1), (1, 1, 3)}
(4 + 3+ 3)

3A. Solve :
$x(1 - x^2)dy + (2x^2y - y - 5x^3)dx = 0$

3B. Find the volume of the region enclosed by the surfaces $z = \sqrt{x^2 + y^2}$ and $z = x^2 + y^2$

P.T.O

3C. Solve the following system of equations by Gauss – elimination method

$$5x + y + z + t = 4$$
$$x + 7y + z + t = 12$$
$$x + y + 6z + t = -5$$
$$x + y + z + 4t = -6$$

(3 + 3+ 4)

4A. Solve $3x(1-x^2)y^2\frac{dy}{dx} + (2x^2 - 1)y^3 = x^3$

4B. Find

(i) $L\{\cot^{-1} s\}$ (ii) $L^{-1}\left\{\frac{e^{-4s}}{(s+1)^3}\right\}$

4C. Find the inverse of the following matrix by elementary row operations.

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

(3 + 3+ 4)

5A. Solve $(2x+1)^2 y'' - 2(2x+1)y' - 12y = x\log(2x+1)$.

5B. Rewrite the following function interms of unit step functions and hence find its Laplace transform

$$f(t) = \begin{cases} t^2, & 0 \le t < 2 \\ 2t + 5, & 2 \le t < 4 \\ 9, & t \ge 4 \end{cases}$$

5C. Solve the following differential equation by Laplace transform method
$x''(t) - 4x'(t) + 4x(t) = 4\cos 2t,\ x(0) = 2,\ x'(0) = 5$ (3 + 4+ 3)

6A. Solve the following differential equation by variation of parameter method

$$y'' + y = \frac{1}{1+\sin x}\ .$$

6B. A spring is stretched 3 inches by a 8 pound weight. The weight is attached to the spring pulled down 6 inches below the equilibrium position and then given an upward velocity of 2ft / sec. If an impressed force 4sin2t is acting on the spring, describe the motion.

6C. Evaluate the following integrals using beta and Gamma functions

(i) $\int_0^{\pi/2} \sqrt{\sin\theta}\ d\theta\ g \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}}$ (ii) $\int_a^b (x-a)^p (b-x)^q\ dx$

(3 + 3+ 4)

******