Reg. No.										

MANIPAL UNIVERSITY

SECOND SEMESTER B.E. DEGREE EXAMINATION – MAY/JUNE 2007

SUBJECT: ENGINEERING MATHEMATICS – II (MAT 102)

(CREDIT SYSTEM)

Saturday, June 09, 2007

Time: 3 Hrs. Max. Marks: 100

Answer any FIVE full questions.

1A. Solve:i) $(x^2 - yx^2)\dfrac{dy}{dx} + y^2 + xy^2 = 0$ ii) $y(2xy + e^x)dx = e^x dy$.

1B. Find: i) Laplace transform of $\left[\left(\sqrt{t} + \dfrac{1}{\sqrt{t}}\right)^3\right]$ ii) $L^{-1}\left[\tan^{-1}\dfrac{2}{s^2}\right]$.

1C. Obtain the second Taylor polynomial of the function f(x,y)=$(1+x+y^2)$ at $x = 1$, y = 0.

((3+3)+(4+4)+6 = 20 marks)

2A. Solve: $\dfrac{dy}{dx} = x^3\cos^2 y - x\sin 2y$.

2B. The sum of three positive numbers is N. Show that the cube root of that product can not exceed $\dfrac{N}{3}$.

2C. i) Express f(t) = $\begin{cases} t^2 & 0 < t < 2 \\ 8t & t > 2 \end{cases}$ in terms of unit step function and find its L. T.

ii) Find f(t) from $F(s) = e^{-\pi s}\left(\dfrac{s}{s^2 + 9}\right)$.

(6+7+(5+2) = 20 marks)

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

3B. Solve: $(y - x - 4)dy - (y + x - 2)dx = 0$.

3C. Find the extreme value of $f(x, y) = x^3 + y^3 - 63x + 12xy - 63y$.

(6+7+7 = 20 marks)

4A. Solve: $x(x - y)dy + y^2 dx = 0$.

4B. A periodic function f(t) of period 2a is defined by f(t) = $\begin{cases} a & 0 < t < a \\ -a & a < t < 2a \end{cases}$. Show that $L[f(t)] = \dfrac{a}{s}\tan h\left(\dfrac{as}{2}\right)$.

4C. Evaluate: $\displaystyle\int_0^1\int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2 + y^2}}\,dydx$.

(6+7+7 = 20 marks)

5A. Change the order of integration: $\int_0^1 \int_{\sqrt{y}}^{2-y} xy\, dxdy$ and evaluate.

5B. Solve by using Laplace transforms: $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = e^{3t}$; $y(0) = 1, y'(0) = -1$.

5C. Find the volume bounded by the cylinder $x^2+y^2=4$ and the planes $y+z = 4$ and $z = 0$.

(7+7+6 = 20 marks)

6A. Solve: $(D-2)^2 y = 8(e^{2x} + \sin 2x + x^2)$.

6B. Solve: $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin[\log(1+x)]$.

6C. Evaluate: $\int_0^1 \int_0^{1-x} e^{\frac{y}{x+y}} dxdy$ using the transformation $x+y = u, \frac{y}{v} = u$.

(6+7+7 = 20 marks)

7A. Find the inverse of the matrix.

$\begin{bmatrix} 8 & 4 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$ by elementary row transformations.

7B. Using Gram-Schmidt orthogonalization process, construct an orthonormal set of vectors from the set (1, 1, 1), (-1, 0, -1) and (-1, 2, 3) in E^3.

7C. Test for consistency and solve:

$5x+3y+7z = 4$, $3x+26y+2z = 9$, $7x+2y+10z = 5$.

(6+7+7 = 20 marks)