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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL UNIVERSITY, MANIPAL - 576 104

SECOND SEMESTER B.E DEGREE MAKE UP EXAMINATION – JULY, 2011

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

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

Note : Answer any FIVE full questions. All questions carry equal marks.

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

1B. Expand sinxy in powers of (x – 1) and $\left(y-\frac{\pi}{2}\right)$ upto second degree terms.

1C. Find the Laplace transform of the triangular wave of period 2a given by

$$f(t)=\begin{cases} t, & 0<t<a \\ 2a-t, & a<t<2a \end{cases}$$

Hence show that $L\{f(t)\}=\frac{1}{s^2}\tanh\left(\frac{as}{2}\right)$. (3 + 3+ 4)

2A. Solve : $\left(1+e^{\frac{x}{y}}\right)dx+e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy=0$.

2B. A simple electrical circuit has a constant c.m.f E in series with an inductance L and capacitance C. Assuming zero initial values find the charge on the capacitor at any time t.

2C. Define a linearly dependent set of vectors. Prove that the vectors $a_1, a_2, \ldots\ldots\ldots a_n$ of E^n are linearly dependent if and only if some one of the vectors is a linear combination of the other vectors.

(3 + 3+ 4)

3A. Solve : $\frac{dy}{dx}=\frac{y}{x+\sqrt{xy}}$.

3B. Solve system of equations using Gauss – elimination method

$x_1 + 3x_2 + 5x_3 = 2$
$3x_1 + 2x_2 + 4x_3 = 7$
$2x_1 + x_2 + x_3 = 4$

3C. Evaluate $\int_0^4 \int_0^{2\sqrt{z}} \int_0^{\sqrt{4z-x^2}} dy\ dx\ dz$.

(3 + 3+ 4)

4A. Solve : $D^4 + 2D^2 + 1\ y = x^2 \cos x$.

4B. Using Gram – Schmidt method construct an orthonormal basis from { (1, –1, 0), (2, –1, –2), (1, –1, –2) }.

4C. Find (i) L $(t^2 e^{-2t} \cos t)$ (ii) $L^{-1}\left(\frac{2s-1}{s^2+2s+17}\right)$

(3 + 3+ 4)

5A. Solve by method of variation of parameters : $D^2 - 6D + 9\ y = \frac{e^{3x}}{x^2}$

5B. Find the dimensions of a rectangular box of maximum capacity whose surface area is given to be S square units when
(i) box is open at the top
(ii) box is closed on all sides

5C. Change the order of integration and hence evaluate:

$$\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}} dydx .$$

(3 + 3+ 4)

6A. Solve the system of equations:

$$2\frac{d^2x}{dt^2} + 3\frac{dy}{dt} - 4 = 0 .$$

$2\frac{d^2y}{dt^2} - 3\frac{dx}{dt} = 0$ subjected to x(0) =y(0) =0, x′(0) = y′(0) = 0

6B. Evaluate $\int_0^1 \frac{x^2 dx}{\sqrt{1-x^4}} \times \int_0^1 \frac{dx}{\sqrt{1+x^4}}$ using Beta and Gamma functions.

6C. Find the volume common to the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$ using double integrals.

(3 + 3+ 4)

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