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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL UNIVERSITY, MANIPAL - 576 104

SECOND SEMESTER B.E. DEGREE MAKE UP EXAMINATION-JULY 2012

SUB: ENGINEERING MATHEMATICS II (MAT 102)
(REVISED CREDIT SYSTEM -2011)

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

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

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

1B. Expand f(x, y) = e^xsin y in powers of x and y up to third degree terms.

1C. Using Gram-Schmidt process construct an orthonormal basis from the set of vectors { (1, 1, 1), (2, -1, 2), (1, 2, 3) } in E^3.

(3 + 3 + 4)

2A. Solve the system of equations using Gauss elimination method:
x + y + z = 8, 2x + 3y + 2z =19, 4x + 2y + 3z =13

2B. Change the order of integration and evaluate $\int_0^\infty \int_0^x x\, e^{-\frac{x^2}{y}}\, dy\, dx.$

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

(3 + 3 + 4)

3A. Using double integration, find the area inside the circle r = a Sinθ and outside the cardioid r = a(1 – Cosθ), a>0.

3B. Obtain the extreme values of $f(x, y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$.

3C. Solve the following system of simultaneous equations

$\frac{dx}{dt} - y = e^t,\ \frac{dy}{dt} + x = \sin t$; given $x(0) = 1,\ y(0) = 0$

(3 + 3 + 4)

4A. Find the volume bounded by the xy-plane, the cylinder $x^2 + y^2 = 1$ and the plane $x + y + z = 3$.

4B Find $L^{-1}\left\{\frac{4s+5}{(s-1)^2(s+2)}\right\}$.

4C. Solve: $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = x\ln(x)$.

(3 + 3 + 4)

5A. Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$, using elementary row transformations.

5B. Solve: $3(x^2 + y^2)dx + x(x^2 + 3y^2 + 6y)dy = 0$

5C. Evaluate:

a). L $t\, e^{3t} \sin 2t$ b). $\int_0^\infty \left(\frac{e^{-t} - e^{-3t}}{t} \right) dt$

(3 + 3 + 4)

6A. A spring with the spring constant 0.75 lb/ft is attached to a support. A 6 lb weight is attached to the spring and is at the equilibrium position. A 1.5 lb force is applied to the support along the line of action of the spring for 4 seconds and is then removed. Describe the motion of the spring.

6B. Solve: $2x^3 + 3y^2 - 7\ \ x dx\ +\ 3x^2 + 2y^2 - 8\ \ y dy = 0$

6C. Evaluate in terms of BetaandGammafunctions:

(a). $\int_0^\infty \frac{e^{-x^2}}{\sqrt{x}}\, dx$ and (b). $\int_0^{\pi/2} \sqrt{\tan\theta}\, d\theta$

(3 + 3 + 4)

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