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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL UNIVERSITY, MANIPAL - 576 104

SECOND SEMESTER B.Tech. DEGREE END SEMESTER EXAMINATION- May 2015

SUB: ENGINEERING MATHEMATICS II (MAT 1201)
(REVISED CREDIT SYSTEM -2014)

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

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

1A. State and prove Cauchy's mean value theorem and hence verify the theorem for the functions sin x and cos x in the interval [a, b].

1B. Change in to polar co-ordinates and evaluate

$$\int_0^{2a}\int_0^{\sqrt{2ax-x^2}} \frac{x}{\sqrt{x^2+y^2}}\,dydx$$

1C. Using triple integral find the volume of the tetrahedron bounded by $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ and the co-ordinate planes.

(3 + 3 + 4)

2A. Discuss the extreme values of the function f given by
$f(x, y) = x^3 + y^3 - 63(x + y) + 12xy$

2B. Solve: $\omega''(x)+2\omega'(x)+\omega(x)=x$, $\omega(0)=-3$ and $\omega'(0)=0$ using Laplace transform method.

2C. Evaluate $\int_{x=0}^{1}\int_{y=0}^{1-x} e^{\frac{y}{x+y}}dydx$ using the transformations $x+y=u,\ y=uv$.

(3 + 3 + 4)

3A. Find the nature of series $1+\frac{x}{2}+\frac{x^2}{5}+\frac{x^3}{10}+\ldots$.

3B. Evaluate $\lim_{x\to a}\left(2-\frac{x}{a}\right)^{\tan\left(\frac{\pi x}{2a}\right)}$.

3C. (i) Prove that absolutely convergent series is convergent.

(ii) Test the nature of the series : $\frac{2}{3.4}+\frac{2.4}{3.5.6}+\frac{2.4.6}{3.5.7.8}+\cdots$

(3 + 3 + 4)

4A. Express the function $f(t)=\begin{cases} t^2, & 0<t<2 \\ t-1, & 2<t<3 \\ 7, & t>3 \end{cases}$ in terms of unit step function and hence find its Laplace transform.

4B. Evaluate $\int_0^{\frac{\pi}{2}}\sqrt{\sin\theta}\ d\theta \times \int_0^{\frac{\pi}{2}}\frac{d\theta}{\sqrt{\sin\theta}}$ using Beta and Gamma function.

4C. Expand f(x,y) = e^xlog(1+y) in powers of x and y upto third degree terms.

(3 + 3 + 4)

5A. If $H = f\left(y-z,\ z-x,\ x-y\right)$, then find the value of $\frac{\partial H}{\partial x}+\frac{\partial H}{\partial y}+\frac{\partial H}{\partial z}$.

5B. The radius of a normal section of a right circular cylinder is 2 units. The axis lies along the straight line $\frac{x-1}{2}=\frac{y+3}{-1}=\frac{z-2}{5}$. Find its equation.

5C. Find : (i) $L\{e^{2t}cos2t\,.sint\}$ (ii) $L^{-1}\left\{\frac{s}{s^2+4s+13}\right\}$

(3 + 3 + 4)

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