Code.No: R05010102 | R05 | SET-1

I B.TECH – EXAMINATIONS, JUNE - 2011
MATHEMATICS – I
(COMMON TO CE, EEE, ME, ECE, CSE, CHEM, EIE, IT, MCT, MMT, AE)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks
- - -

1.a) Test the following series for absolute and conditional convergence
$\frac{1}{1^2+1}-\frac{2}{2^2+1}+\frac{3}{3^2+1}-\frac{4}{4^2+1}+........$

b) Test for convergence the series $\sum_{n=1}^{\infty}\frac{(2n)!}{(3!)^2}x^n$. [8+8]

2.a) If $f_1 = xy + yz + zx, f_2 = x^2 + y^2 + z^2, f_3 = x + y + z$. Determine if f_1, f_2, f_3 are functionally dependent. If so find the relation.

b) Final the circle of curvature for the curve $x^3 + y^3 = 3xy$ at the point $\left(\frac{3}{2},\frac{3}{2}\right)$. [8+8]

3.a) Trace the curve $x=\frac{3at}{1+t^3},\ y=\frac{3at^2}{1+t^3},\ a>0$.

b) Find the length of the arc of the parabola $y^2 = 4ax$ cut off by the line $3y = 8x$. [8+8]

4.a) Find the orthogonal trajectories of the family of curves $r^2 = a^2 C\text{os}\,2\theta$ (a is the parameter).

b) Solve the differential equation $(2x+3)^2\frac{d^2y}{dx^2}-(2x+3)\frac{dy}{dx}-12y=6x$. [8+8]

5.a) Find the Laplace Transform of the Saw – Tooth wave, $f(t)=\frac{k}{p}t,\quad 0<t<p$
$f(t+p)=f(t)$

b) Prove that $L(L(t)) = L(f*g) = H(s) = F(s)G(s)$. Where $(f*g)t$ is the convolution of f and g and $L(f(t)) = F(s),\ L(g(t)) = G(s)$. [8+8]

6.a) Evaluate by changing the order of integration $\int_0^1\int_x^{\sqrt{2-x^2}}\frac{x}{\sqrt{x^2+y^2}}dy\,dx$.

b) By transforming into cylindrical coordinates evaluate $\iiint(x^2+y^2+z^2)dx\,dy\,dz$, taken over the region $0 \le z \le x^2 + y^2 \le 1$. [8+8]

7.a) Find the angle between the normals to the surface $xy = z^2$ at the points $(4,1,2)$ *and* $(3,3,-3)$.

b) Show that curl(curl F) = grad(div F) - ∇^2F. [8+8]

8.a) Evaluate $\iiint \nabla \cdot \overline{F}\, dV$ where V is the cylindrical region bounded by $x^2 + y^2 = 9,\ z = 0,\ z = 2,\ F = yi + xj + z^2k$.

b) Verify Green's Theorem in a plane for $\int_C (y - \sin x)dx + \cos x dy$ where C is the Triangle joins $(0,0), \left(\frac{\pi}{2}, 0\right)$ *and* $\left(\frac{\pi}{2}, 1\right)$. [8+8]

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SET-2

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1.a) Trace the curve $x = \frac{3at}{1+t^3},\ y = \frac{3at^2}{1+t^3},\ a > 0$.

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[8+8]

2.a) Find the orthogonal trajectories of the family of curves $r^2 = a^2 C\text{os}\, 2\theta$ (a is the parameter).

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4.a) Evaluate by changing the order of integration $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}}\, dy\, dx$.

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SET-3

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- - -

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