Code No: 09A1BS01 **R09** **Set No. 2**

I B.Tech Examinations,December 2010
MATHEMATICS-I
Common to CE, ME, CHEM, BME, IT, MECT, MEP, AE, BT, AME, ICE, E.COMP.E, MMT, ETM, EIE, CSE, ECE, EEE

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find $L\left[\frac{\cos 4t \sin 2t}{t}\right]$
   (b) Find the Laplace inverse transform of $\log\left(\frac{s^2+4}{s^2+9}\right)$ [7+8]

2. (a) Test the convergence of the series $1+\frac{3x}{7}+\frac{3.6}{7.10}x^2+\frac{3.6.9}{7.10.13}x^3+\frac{3.6.9.12}{7.10.13.16}x^4+.....$
   (b) Find the interval of convergence for the series $\sum_{n=1}^{\infty}(-1)^n\frac{n(x+1)^n}{2^n}$ [7+8]

3. (a) Find the length of an arc of the curve $x = e^{\theta}\sin\theta,\ y = e^{\theta}\cos\theta\ from\ \theta = 0\ to\ \frac{\pi}{2}$
   (b) Evaluate $\iint_R y^2 dxdy$ were R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$ [8+7]

4. (a) Find the differential equation of all circles whose radius is r
   (b) Solve the differential equation $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$
   (c) Find the equation of the curve, in which the length of the subnormal is proportional to the square of the ordinate. [4+6+5]

5. (a) Solve the differential equation $(D^4+2D^2+1)y = x^2\cos^2 x$
   (b) Solve the differential equation $(D^2+2D+1)y = e^{-x}$ [7+8]

6. (a) Expand $e^{x\sin x}$ in powers of x.
   (b) Find the volume of the greatest rectangular parallelopiped that can be 'inscribed in the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$. [8+7]

7. (a) Show that the evolute of the ellipse $x = a\cos\theta, y = b\sin\theta$ is $(ax)^{\frac{2}{3}}+(by)^{\frac{2}{3}} = (a^2-b^2)^{\frac{2}{3}}$
   (b) Show that the envelope of the lines whose equations are $x\sec^2\theta + y\cos ec^2\theta = c$ is a parabola which touches the axes of coordinates. [8+7]

8. (a) Find the work done by the force $\bar{F} = (2y+3)\,i + xzj + (yz-x)\,k\ when$ it moves a particle from the point (0,0,0) to (2,1,1) along the curve $x = 2t^2$, $y = t\ \ and\ \ z = t^3$
   (b) Use divergence theorem to Evaluate $\iint_S (y^2z^2i + z^2x^2j + z^2y^2k).\ \bar{n}$ds where S is the part of the unit sphere above the x y plane. [8+7]

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Code No: 09A1BS01 **R09** **Set No. 4**

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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find L $[(t^2+1)^2]$
   (b) Find Inverse Laplace transform of $\frac{3s+7}{(s^2-2s-3)}$ [7+8]

2. (a) Find the radius of curvature at any point on $y^2 = 4ax$ and hence show that the radius of curvature at the vertex is equal to the semi latus rectum.
   (b) Trace the curve $r = a\,(1+\cos\theta)$ [7+8]

3. (a) Test the convergence of the series $\frac{3^2}{6^2} + \frac{3^2.5^2}{6^2.8^2} + \frac{3^2.5^2.7^2}{6^2.8^2.10^2} + ...$
   (b) Test whether the following series is absolutely convergent or conditionally convergent $\frac{1}{5\sqrt{2}} - \frac{1}{5\sqrt{3}} + \frac{1}{5\sqrt{4}} .....(-1)^n\frac{1}{5\sqrt{n}}$ [7+8]

4. (a) Solve the differential equation $(D^2+2)y = e^x\cos x$
   (b) Solve the differential equation $(D^3+2D^2+D)y = x^3$ [7+8]

5. (a) If $u = x^2-2y$, $v = x+y+z$, $w = x-2y+3z$ find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$
   (b) Find the maximum and minimum values of $f(x) = x^3+3xy^2-3x^2-3y^2+4$ [8+7]

6. (a) The curve y^2 (a + x) = x^2 (3a - x) revolved about the x-axis. Find the volume of the solid generated.
   (b) Evaluate $\int\limits_0^a \int\limits_0^{\sqrt{a^2-y^2}} (x^2+y^2)\,dxdy$ by changing into polar coordinates [8+7]

7. (a) Form the differential equation by eliminating arbitrary constants y = Ae^x+Be^{-x}
   (b) Solve the differential equation $(e^y+1)\cos x dx + e^y \sin x dy = 0$
   (c) Find the curve in which the perpendicular upon the tangent from the foot of the ordinate of the point of contact is constant and equal to a. [4+6+5]

8. (a) If $\bar{F}$ and G are two vectors, then prove that div $\left(\bar{F}\times\bar{G}\right) = \bar{F}$ curl $\bar{G}$ - $\bar{G}$ .curl $\bar{F}$
   (b) Evaluate $\oint\limits_c xdy + ydx$ where c is the loop of the Folium of D' cartes $x = \frac{3at}{1+t^3}$, $y = \frac{3at^2}{1+t^3}$ [8+7]

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Code No: 09A1BS01 **R09** **Set No. 1**

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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find $L\left[3\cos .3t\cos 4t\right]$
   (b) Find the inverse Laplace transform of $\log\left(1+\frac{16}{s^2}\right)$ [7+8]

2. (a) Solve the differential equation $(D^4 - 2D^3 + 2D^2 - 2D + 1)y = \cos x$
   (b) Solve the differential equation $(D^3 - 3D - 2)y = x^2$ [7+8]

3. (a) Form the differential equation by eliminating arbitrary constants $Sin^{-1}x + Sin^{-1}y = C$.
   (b) Solve the differential equation $\frac{y}{x}\frac{dy}{dx} = \sqrt{1 + x^2 + y^2x^2 + y^2}$.
   (c) Prove that the system of Parabolas $y^2 = 4a(x + a)$ is self orthogonal. [3+6+6]

4. (a) Apply Rolle's theorem for $\sin n\sqrt{\cos 2n}$ in $\left[0, \frac{\pi}{4}\right]$ and find x such that $0 < x < \frac{\pi}{4}$
   (b) Expand $e^x.\cos y$ near the point $\left[1, \frac{\pi}{4}\right]$ by Taylor's theorem. [7+8]

5. (a) Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1.3.5.\cdots(2n+1)}{2.5.8\cdots(3n+2)}$
   (b) Test the convergence of the series $\sum_{n=1}^{\infty}\left(\frac{n^2}{2^n} + \frac{1}{n^2}\right)$ [8+7]

6. (a) Find the radius of curvature at the point θ on x = a log $(\sec\theta + \tan\theta)$ and $y = a\sec\theta$
   (b) Trace the curve $x^3 + y^3 = 3axy$ [8+7]

7. (a) Prove that the surface area of the solid generated when the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is revolved about its major axis is $2\pi\ ab\left[\sqrt{1-e^2} + \frac{\sin^{-1}e}{e}\right]$ where e is the eccentricity of the ellipse.
   (b) Evaluate $\int\int\int (xy + yz + zx)dxdydz$, where V is the region of space founded by x=0, x=1, y=0, y=2 and z=0, z=3 [7+8]

8. Verify stoke's theorem for $F = (2x - y)i - yz^2j - y^2zk$ over upper half surface of $x^2 + y^2 + z^2 = 1$ bounded by its projection on the xy plane. [15]

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Code No: 09A1BS01 **R09** **Set No. 3**

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MATHEMATICS-I
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find $L\left[te^{2t}\sin 3t\right]$
   (b) Find $L^{-1}\left[\frac{1}{s^3(s^3+1)}\right]$ [8+7]

2. (a) By considering the function $(x-2)\log x$ show that the equation $x\log x = 2-x$ is satisfied by at least one value of x lying between 1 and 2.
   (b) Find the minimum of $x^2+y^2+z^2$ subject x + y z = 3a [7+8]

3. (a) Find the volume of the solid obtained by revolving one arch of the cycloid x=a $(\theta + \sin\theta,)$ y = a (1+ cosθ) about its base.
   (b) Calculate $\int\int_R r^3 dr d\theta$ over the area included between the circles $r = 2\sin\theta$ and $r = 4\sin\theta$ [8+7]

4. (a) If $\bar{F}$ andG are two vectors, then div $\left(\bar{F}\times\bar{G}\right) = \bar{F}$ curl $\bar{G}$-$\bar{G}$ .curl $\bar{F}$
   (b) Evaluate by Greens theorem $\int_C (x^2 - Coshy)dx + (y+\sin x)dy$ where C is the rectangle with vertices (0,0), (π, 0), (π, 1), (0, 1) [8+7]

5. (a) Test the convergence of the series $\sum_{n=1}^{\alpha} \frac{2n!}{n!(n)}$
   (b) Test the convergence of the series $= \frac{2.5.8.....3n-1}{1.5.9.....4n-3}$
   (c) Find the interval of convergence for the following series $\sum \frac{(n^2-1)}{n^2+1}x^n$. [5+5+5]

6. (a) If CP and CD are a pair of conjugate diameters of an ellipse prove that the radius of curvature at P is $\frac{(CD)^3}{ab}$ a and b being the lengths of the semiarcs of the ellipse.
   (b) Trace the curve $y^2 = x^2\frac{(3a-x)}{(a+x)}$ [8+7]

7. (a) Find the differential equation of all circles which pass through the origin and whose centers are on x- axis.
   (b) Solve the differential equation $\frac{dy}{dx} + x\sin 2y = x^3\cos^2 y$
   (c) The rate at which bacteria multiply is proportional to the instantaneous N numbers present. If the original number doubles in 2hrs? When it will be trebled? [4+6+5]

8. (a) Solve the differential equation $(D^2-1)y = x\sin x + (1+x^2)e^x$

(b) Solve the differential equation $(D^2 + 4)y = Tan2x$ [8+7]

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