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

I B.Tech Regular Examinations,June 2010
MATHEMATICS-1
Common to ME, CHEM, BME, IT, MECT, MEP, AE, BT, AME, ICE, E.COMP.E, MMT, ETM, EIE, CSE, ECE, EEE,CE

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (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]

2. (a) Form the differential equation by eliminating arbitrary constants
   y = e^x (ACos x + B Sin x)
   (b) Solve the differential equation $e^{x-y}dx + e^{y-x}dy = 0$
   (c) If the air is maintained at 15^0C and the temperature of the body drops from 70^0 C to 40^0 in 10 minutes. What will be its temperature after 30 minutes. [4+5+6]

3. (a) If $u^3 + xv^2 - uy = 0$, $u^2 + xyv + v^2 = 0$ find $\frac{\partial u}{\partial x}, \frac{\partial v}{\partial x}, \frac{\partial u}{\partial y}, \frac{\partial v}{\partial y}$
   (b) Find the shortest distance from the point (1,0) to the parabola $y^2 = 4x$ [8+7]

4. (a) Find the directional derivative of f(x,y,z)=xy^2+yz^3 at the point (2,-1,1) in the direction of the vector i+2j+2k.
   (b) Evaluate by stoke's theorem $\int\limits_C (e^x dx + 2ydy - dz)$ where c is the curve $x^2 + y^2 = 9 \ and \ z = 2$ [8+7]

5. (a) Find the volume of the solid generated by cycloid x = a (θ + sinθ), y = a (1+cosθ), when it is revolved about its base.
   (b) Evaluate $\int_0^{\log z} \int_0^x \int_0^{x+\log y} e^{x+y+z} dzdydx$ [8+7]

6. (a) Find the Laplace transform of periodic function f(t) with period T, where $f(t) = \frac{4Et}{t} - E, \ 0 \le t \ \le T/2 = 3E - \frac{4E}{T}t, \ \frac{T}{2} \le t \le T$
   (b) Find the inverse Laplace transform of $\frac{(2s^2-6s+5)}{(s^3-6s^2+11s-6)}$ [8+7]

7. (a) Test the convergence of the series $\frac{1}{3} + \frac{1.4}{3.6} + \frac{1.4.7}{3.6.9} + \frac{1.4.7.10}{3.6.9.12} + ...$
   (b) Prove that the series $\frac{1}{2^3} - \frac{1}{3^3}(1+2) + \frac{1}{4^3}(1+2+3) - \frac{1}{5^3}(1+2+3+4) .....\infty$ is conditionally convergent. [7+8]

8. (a) The radius of curvature at any point P on the parabola $y^2 = 4ax$ and S is the focus, then prove that $\rho^2 \alpha \ (SP)^3$
   (b) Find the equation of the circle of curvature of the curve $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta + \theta\cos\theta)$ [7+8]

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