Code No: R05010102 **R05**

I B.Tech Examinations,May/June 2012
MATHEMATICS - I
Common to CE, ME, CHEM, BME, IT, MECT, MEP, AE, AME, ICE, E.COMP.E, MMT, ETM, E.CONT.E, EIE, CSE, ECE, CSSE, EEE

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Test the series for convergence whose nth term is (3n-1)/2^n. [5]
   (b) Examine whether the following series is absolutely convergent or conditionally convergent $1 - \frac{x^2}{2} + \frac{x^4}{3} - \frac{x^6}{4} + \ldots\ldots\ (x > 0)$. [5]
   (c) Write the Maclaurin's series with Lagrange's form of remainder for f(x) = cosx. [6]
2. (a) Obtain the differential equation of all the rectangular hyperbolas with asymptotes as the co-ordinate axes. [3]
   (b) Solve the differential equation: $x\frac{dy}{dx} + y = x^3y^6$. [7]
   (c) The rate at which bacteria multiply is proportional to the number present initially. If the original number doubles in 2 hours; in how many hours will it be tripled? [6]
3. Verify Stokes theorem for F=x^2i-yzj+k integrated around the square x=0, y=0, x=1,and y=1 [16]
4. (a) Solve the differential equation: $(D^4–4)$y= x cos2x
   (b) Solve the differential equation: $(x^2D^2+4x\text{D}–4)$y=x log x. [8+8]
5. (a) Solve $(D^2+1)x=$ t cos2t using Laplace transforms given that x(0)=0, x(0)=0.
   (b) Evaluate $\iint\limits_R x^2\, dxdy$ where R is the region in the first quadrant bounded by the hyperbola xy=16 and the lines y=x, y=0 and x=8. [8+8]
6. (a) Prove that curl(**A**×**B**)=**A**div**B**-**B**div**A** +(**B**.∇)**A**-(**A**.∇)**B.**
   (b) Find the directional derivative of ϕ (x,y,z) = $x^2yz + 4xz^2$ at the point (1, –2, –1) in the direction of the normal to the surface f(x,y,z) = x logz $-y^2$ at (–1, 2,–1). [8+8]
7. (a) Find the perimeter of the curve $3ay^2 = x^2(a - x)$
   (b) Find the volume of a spherical cap of height h cut off from a sphere of radius a. [8+8]
8. (a) If x = r sinθ cosϕ, y = r sinθ sinϕ and z = r cosθ prove that $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)} = r^2 \sin\theta$. [6]
   (b) Find the radius of curvature at any point on the curve y = c cosh$\frac{x}{c}$. [10]

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