Code No: RR100102 **RR**

B.Tech. I Year(RR) Supplementary Examinations, May/June 2010
MATHEMATICS-I
(Common to all branches)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Test the convergence of the series $\sum \frac{(n\,!)^2}{(2n)\,!}\,x^{2n}$ [5]

   (b) Test the following series for absolute /conditional convergence
   $\sum\limits_{n=2}^{\infty} \frac{(-1)^n}{n(\log n)^2}$ [6]

   (c) Show that $\sin^{-1} x = x + \frac{x^3}{3!} + \frac{1^2.3^2}{5!}\,x^5 + \frac{1^2.\,3^2.\,5^2}{7!}\,x^7 + ...$ [5]

2. (a) Find the stationary points of the following function 'u' and find the maximum or the minimum
   $u = x^2 + 2xy + 2y^2 + 2x + y$

   (b) Considering the evolute of a curve as the envelope of its normals, find the evolute of the ellipse
   $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ [8+8]

3. (a) Trace the Folium of Decartes : $x^3 + y^3 = 3axy$.

   (b) Determine the volume of the solid generated by revolving the limacon
   $r = a + b\cos\theta$ (a>b) about the initial line. [8+8]

4. (a) Obtain the differential equation of the coaxial circles of the system
   $x^2+y^2+2ax + c^2 = 0$ where c is a constant and a is a variable. [3]

   (b) Solve the differential equation:
   $(x^2 - 2xy + 3y^2)\,dx + (y^2 + 6xy - x^2)\,dy = 0$. [7]

   (c) Find the orthogonal trajectory of the family of the cardioids
   $r = a\,(1 + \cos\theta)$ [6]

5. (a) Solve the differential equation: $(D^2 - 5D + 6)y = e^x \sin x$.

   (b) Solve the differential equation: $y''' + 2y'' - y' - 2y = 1 - 4x^3$. [8+8]

6. (a) Find the Laplace Transformation of the following function
   $e^{-3t}(2\cos 5t - 3\sin 5t)$ [5]

   (b) State and prove convolution theorem to find the inverse of Laplace transforms. [5]

   (c) Use convolution theorem to find
   $L^{-1}\left[\frac{16}{(s^2+4)(s^2+4)}\right]$ [6]

7. (a) Evaluate $\nabla.[r\nabla(1/r^3)]$ where $r = \sqrt{x^2 + y^2 + z^2}$

   (b) Evaluate $\iint\limits_s \mathbf{A}.\mathbf{n}\,ds$ where $\mathbf{A}$=18zi-12j+3yk and s is that part of the plane 2x+3y +6z=12 which is located in the first octant. [8+8]

8. Verify Stokes theorem for the function $F = x^2 i + xyi$ integrated round the square whose sides are x = 0, y = 0, x = a and y = a in the plane z = 0. [16]

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