







Subject Code: R13102/R13

Set No - 4

I B. Tech I Semester Regular Examinations Feb./Mar. - 2014

**MATHEMATICS-I**

(Common to All Branches)

Time: 3 hours

Max. Marks: 70

Question Paper Consists of **Part-A** and **Part-B**  
 Answering the question in **Part-A** is Compulsory,  
 Three Questions should be answered from **Part-B**  
 \*\*\*\*\*

**PART-A**

- 1.(i) Find the distance from the centre at which the velocity in simple harmonic motion will be 1/3rd of the maximum.
- (ii) Find a point within a triangle such that the sum of the squares of its distances from the three vertices is minimum.
- (iii) Find the solution, by Laplace transform method of the integro-differential equation  $y' + 4y = \int_0^t y(t)dt$ ,  $y(0) = 0$ .
- (iv) Uranium disintegrates at a rate proportional to the amount present at that time. If M and N grams of Uranium are present at times  $T_1$  and  $T_2$  respectively, find the half life of Uranium.
- (v) Find the complete solution of  $(D^3 - 3D^2 D' + 3DD'' - D'^3)z = 0$ .
- (vi) Solve  $z^2 = 1 + p^2 + q^2$ .

[4+4+4+4+3+3]

**PART-B**

- 2.(a) Solve  $(3y^2 + 4xy - x^2)dx + x(x + 2y)dy = 0$
- (b) Find the solution of  $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} - 6y = \sin 4x \cos x$ . [8+8]
- 3.(a) Find the complete solution of  $y'' - 2y = x^2 e^{3x} + e^x \cos 2x$ .
- (b) Solve  $yz + z \log z = x(\log z)^2$ . [8+8]
- 4.(a) Find the Laplace transform of  $f(t) = te^{2t} \cos 2t$ .
- (b) If  $u = \sin^{-1}\left(\frac{x^2 + y^3}{\sqrt{x^2 + y^2}}\right)$ , prove that  $xu_x + yu_y = \frac{5}{2} \tan u$ . [8+8]
- 5.(a) If  $w = (y - z)(z - x)(x - y)$ , find the value of  $\frac{\partial w}{\partial x} + \frac{\partial w}{\partial y} + \frac{\partial w}{\partial z}$ .
- (b) Solve  $y'' + 2y' + 5y = e^{-t} \sin t$ ,  $y(0) = 0$  and  $y'(0) = 1$  using Laplace transforms. [8+8]
- 6.(a) Form the partial differential equation by eliminating the arbitrary constants 'a' and 'b' from  $z = ax + by + a^2 + b^2$ .
- (b) Using method of separation of variables, solve  $u_{xt} = e^{-t} \cos x$  with  $u(x, 0) = u(0, t) = 0$ . [8+8]
- 7.(a) Find the temperature in a thin metal rod of length L, with both ends insulated and with initial temperature in the rod is  $\sin\left(\frac{\pi x}{L}\right)$ .
- (b) Solve the partial differential equation  $px^2 + qy^2 = z^2$ . [8+8]