

Register Number:

Name of the Candidate:

**B.Sc. DEGREE EXAMINATION December 2014****(CONSTRUCTION MANAGEMENT)****(FIRST SEMESTER)****120: MATHEMATICS-I**

Time: Three hours

Maximum: 75 marks

**Answer ALL questions****(5× 15 = 75)**

1. a. (i) Solve  $(1+x^2)\frac{dy}{dx} + 2xy = \cos x$  (ii) Solve  $(D^2-5D+6)y=e^x\cos 2x$   
(OR)
- b. Solve  $\frac{d^2y}{dx^2} + 4y = 4 \tan 2x$  using method of variation of parameters.
2. a. (i) Find the centre and circle of curvature of the curve  $\sqrt{x} + \sqrt{y} = \sqrt{a}$  at  $\left(\frac{a}{4}, \frac{a}{4}\right)$ .  
(ii) Find the envelope of the family of the circles  $(x-\alpha)^2 + y^2 = 4\alpha$ , where  $\alpha$  is the parameter.  
(OR)
- b. (i) Find the maximum or minimum value of  $x^2-xy+y^2-2x+y$ .  
(ii) By changing the order of integration evaluate  $\int_0^a \int_0^{\sqrt{ax}} x^2 dy dx$
3. a. Discuss the convergence or divergence of the series  $\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \dots$   
(OR)
- b. Examine the convergence of the series  $\frac{1}{2} + \frac{2}{3}x + \left(\frac{3}{4}\right)^2 x^2 + \left(\frac{4}{5}\right)^3 x^3 + \dots$
4. a. (i) Find the value of constants a, b, c so that the vector  $\vec{F} = (x+2y+az)\vec{i} + (bx-3y-z)\vec{j} + (4x+cy+2z)\vec{k}$  is irrotational.  
(ii) Find the dissectional derivative of  $\phi = x^2yz + 4xz^2$  at (1, 1, 1) in the direction of  $\vec{i} + \vec{j} - \vec{k}$ .  
(OR)
- b. Verify the Gauss divergence theorem for  $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$  over the cube bounded by  $x=0, x=1, y=0, y=1, z=0, z=1$ .

5. a. (i) Find the Laplace transform of  $e^{-t} \int_0^t \left( \frac{\sin t}{t} \right) dt$

(ii) Find  $L^{-1} \left[ \frac{1}{(s^2 + 4)^2} \right]$  using convolution theorem.

(OR)

b. Solve  $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} - 5y = 5$  given that  $y=0$ ,  $\frac{dy}{dt} = 2$  when  $t=0$ .

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