

Code No: R10102

R10
SET - 1
I B. Tech I Semester Supplementary Examinations, Nov/Dec - 2017
MATHEMATICS-I

Time: 3 hours

(Comm. to All Branches)

Max. Marks: 75

 Answer any **FIVE** Questions

 All Questions carry **Equal** Marks

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1. a) Solve  $\frac{dy}{dx} + \frac{y}{x} \log y = \frac{y}{x^2} (\log y)^2$ . (8M)
- b) Find the orthogonal trajectories of the family of circles  $x^2 + (y-c)^2 = c^2$ . (7M)
2. a) Solve  $(D^2 + 2D + 1)y = 2x + \cos x$ . (8M)
- b) Solve  $(D^2 + 4D + 3)y = e^{2x}$ . (7M)
3. a) Determine whether the functions  $U = \frac{x}{y-z}$ ,  $V = \frac{y}{z-x}$ ,  $W = \frac{z}{x-y}$  are dependent. If dependent find the relationship between them. (8M)
- b) Find the volume of the largest rectangular paralleopiped that can be inscribed in the ellipsoid  $\frac{x^2}{4} + \frac{y^2}{9} + \frac{z^2}{25} = 1$ . (7M)
4. Trace the curve  $y^2(a+x) = x^2(3a-x)$ . (15M)
5. a) Find the perimeter of the loop of the curve  $9ay^2 = (x-2a)(x-5a)^2$ . (8M)
- b) Find the volume of the solid formed by revolving one loop of the lemniscates  $r^2 = a^2 \cos 2\theta$  about the line  $\theta = \frac{\pi}{2}$ . (7M)
6. a) Evaluate  $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{x^2+y^2} dy dx$  by changing into polar coordinates. (8M)
- b) By changing the order of integration, evaluate  $\int_0^3 \int_1^{\sqrt{4-y}} (x+y) dx dy$ . (7M)
7. a) Find the directional derivative of  $\phi = x^2 yz + 4xz^2$  at  $(1, -2, -1)$  in the direction of  $2\bar{i} - \bar{j} - 2\bar{k}$ . (8M)
- b) Find the angle between the normal to the surface  $x^2 = yz$  at the points  $(1, 1, 1)$  and  $(2, 4, 1)$ . (7M)
8. Verify Green's theorem for  $\int_C (xy + y^2) dx + (x^2) dy$  where C is the curve bounded by  $y = x^2$  and  $y = x$ . (15M)