Subject Code: R10102/R10 **Set No - 1**

I B.Tech I Semester Supplementary Examinations May/June - 2016

MATHEMATICS-I

(Common to All Branches)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

⁂ ⁂ ⁂ ⁂ ⁂

1. (a) Solve $3e^x \tan y dx + (1-e^x)\sec^2 y dy = 0$.
   (b) Find the orthogonal trajectories of $r^2 = a\sin 2\theta$.

[8+7]

2. (a) $Solve\ (D^3 + 2D^2 + D)y = x + Sin2x.$
   (b) $Solve\ (D^3 - 4D^2 - D + 4)y = e^{3x}Cos2x.$

[8+7]

3. (a) Show that U = $x^2e^{-y}\cosh z$, V = $x^2e^{-y}\sinh z$, w = $x^2 + y^2 + z^2 - xy - yz - zx$ are functionally dependent. If dependent find the relationship between them.
   (b) Investigate the maxima and minima, if any, of the function f(x) = $x^3y^2(1 - x - y)$.

[8+7]

4. Trace the curve $x^3 + y^3 + 3axy = 0$.

[15]

5. (a) Find the length of the arc of the curve $y = \log\left(\frac{e^x - 1}{e^x + 1}\right)$ from $x = 1$ to $x = 2$.
   (b) Find the volume of the solid that results when the region enclosed by the curves xy = 1, x - axis and x = 1 rotated about x – axis.

[8+7]

6. (a) Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{a^2 - x^2 - y^2}\, dydx.$
   (b) By changing the order of integration, evaluate $\int_0^3 \int_1^{\sqrt{4-y}} (x + y)dxdy.$

[8+7]

7. (a) Find the angle between the normal to the surface $x^2 = yz$ at the points (1,1,1) and (2,4,1).
   (b) Find the constants a, b, c so that the vector $\bar{f} = (x + 2y + az)\bar{i} + (bx - 3y - z)\bar{j} + (4x + cy + 2z)\bar{k}$ is irrotational. Also find ϕ (scalar potential).

[8+7]

8. (a) Find the work done by $\overline{F} = (2x - y - z)\bar{i} + (x + y + z)\bar{j} + (3x - 2y - 5z)\bar{k}$ along a curve C in the xy – plane given by $x^2 + y^2 = 9$, z = 0.

   (b) Evaluate $\int_V \overline{F}\, dV$ when $\overline{F} = x\bar{i} + y\bar{j} + z\bar{k}$ and V is the region bounded by x = 0 , y = 0 , y = 6 , z = 4 , $z = x^2$.

[8+7]

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