Code No: R10102 **R10** SET - 1

**I B. Tech I Semester Supplementary Examinations, May - 2017**
**MATHEMATICS-I**
(Com. to All Branches)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Solve $\frac{dy}{dx} = \frac{1}{(1+y^2)}\left(e^{\tan^{-1}x} - y\right)$. (7M)

   b) A body is heated to $110^\circ$ C and placed in air at $10^\circ$ C. After 1 hour its temperature is $60^\circ$ C. How much additional time is required for it to cool to $30^\circ$ C? (8M)

2. a) Solve $\left(D^2+2\right)y = x^2e^{3x} + e^x\cos 2x$ , *where* $D = \frac{d}{dx}$. (7M)

   b) Solve $\left(D^2+3D+2\right)y = e^{-x} + x^2 + \cos x$ , *where* $D = \frac{d}{dx}$. (8M)

3. a) If $u = x+y+z,\ uv = y+z,\ uvw = z$ , find $\frac{\partial(x,y,z)}{\partial(u,v,w)}$. (7M)

   b) Examine the function $f(x,y) = \sin x + \sin y + \sin(x+y)$ for extreme. (8M)

4. a) Trace the curve $x^3 + y^3 = 3axy$. (7M)

   b) Trace the curve $r^2 = a^2\cos 2\theta$. (8M)

5. a) Find the length of the arc of parabola $y^2 = 4ax$ cut-off by latus rectum. (7M)

   b) Find the surface area of the solid generated by the revolution of the asteroid $x = a\cos^3 t$ , $y = a\sin^3 t$ about the $y-axis$. (8M)

6. a) Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dx\,dy$ by changing to polar coordinates. (5M)

   b) Evaluate $\int_{-1}^{1} \int_{0}^{z} \int_{x-z}^{x+z} (x+y+z)\,dx\,dy\,dz$. (5M)

   c) Change the order of integration and hence evaluate $I = \int_0^a \int_{x/a}^{\sqrt{x/a}} \left(x^2+y^2\right)dx\,dy$. (5M)

7. a) Evaluate divergence of $\left(2x^2z\,i - xy^2z\,j + 3yz^2\,k\right)$ at the point $(1, 1, 1)$. (5M)

   b) Show that $\nabla^2 r^n = n(n+1)r^{n-2}$ where $r^2 = x^2+y^2+z^2$. (5M)

   c) Evaluate *Curl of* $\bar{V} = yz\,i + 3zx\,j + z\,k$ at the point $(2, 3, 4)$. (5M)

8. Verify Stoke's theorem for a vector field defined $\bar{F} = -y^3 i + x^3 j$, in the region $x^2 + y^2 \le 1,\ z = 0$. (15M)
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