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°C and placed in air at 10° C. After 1 hour its temperature is 60° C. How much additional time is required for it to cool to 30°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 $u=x+y+z,\ u\,v=y+z,\ u\,v\,w=z$, 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 $\bar{F}=-y^3i+x^3j$, in the region $x^2+y^2\le 1,\ z=0$. (15M)
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