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MLR 16

Code No: A2HS001

MLR INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

I B.Tech I Sem Regular Examinations, December -2016

DIFFERENTIAL EQUATIONS AND APPLICATIONS

(Common to All Branches)

Time: 3hours Max.Marks:75

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 25 marks. Answer all Questions in Part A.
3. Part B consists of 5 units. Answer any one full question from each unit.
Each question carries 10 Marks and may have a,b,c as sub sections.

PART A

1. a) Find an Integrating factor of $(y\log y)dx+(x-\log y)\,dy=0$ 2M

b) Find complementary function of $\left(D^2+D+1\right)y=\left(1-e^x\right)^2$ 2M

c) Evaluate $\lim\limits_{\substack{x\to 1\\ y\to 2}}\left(\dfrac{2x^2y}{x^2+y^2+1}\right)$ 2M

d) Define Linear partial differential equation of first order. 2M

e) Find a_n if $f(x)=x$ in $(-l,\,l)$ 2M

2. a) Solve $\left(x^2y-2xy^2\right)dx-\left(x^3-3x^2y\right)dy=0$ 3M

b) Find P.I of $\left(D^2+4D+4\right)y=3\sin x+4\cos x$ 3M

c) Find the stationary points of x^3+y^3-3axy 3M

d) Find the general solution of Lagrange's linear equation $p\,Tan\,x+q\,Tan\,y=Tan\,z$ 3M

e) Write Dirchilet's conditions for Fourier expansion 3M

PART B

3. a) Solve $\left(xy^2-e^{\frac{1}{x^3}}\right)dx-x^2y\,dy=0$ 5M

b) A body originally at 80^0c cools down to60^0c in 20 minutes. The temperature of the air being 40^0c. Estimate the temperature of the body after 40 minutes from original. 5M

OR

4. a) Solve $\left(xy^3+y\right)dx+2\left(x^2y^2+x+y^4\right)dy=0$ 5M

b) If the air is maintained at 30^0c and the temperature of the body cools from 80^0c to 60^0c in 12 min, find the temperature of the body after 24 min. 5M

5.	a)	Using method of variation of parameters, solve $\frac{d^2y}{dx^2}+4y=\tan 2x$	5M
	b)	An uncharged condenser of capacitor C is charged by applying an e.m.f $E\sin\left(\frac{t}{\sqrt{LC}}\right)$, through leads of self-inductance L and negligible resistance. Determine the charge on one plate any time t.	5M

OR

6.	a)	Solve $\frac{d^2y}{dx^2}-3\frac{dy}{dx}+2y=x\,e^{3x}+\sin 2x$	5M
	b)	Find the complete solution of $y''-2y'+2y=x+e^x\cos x$	5M
7.	a)	Discuss the maximum and minimum of $f(x,\,y)=x^3y^2(1-x-y)$	5M
	b)	If $u=x+y+z,\ uv=y+z,\ uvw=z$ show that $\frac{\partial(x,\,y,\,z)}{\partial(u,\,v,\,w)}=u^2v$	5M

OR

8.	a)	If $u=u\left(\frac{y-x}{xy},\ \frac{z-x}{xz}\right)$ then prove that $x^2\frac{\partial u}{\partial x}+y^2\frac{\partial u}{\partial y}+z^2\frac{\partial u}{\partial z}=0$	5M
	b)	Find the maximum of $x^m\,y^n\,z^p$, subject to the condition $x+y+z=a.$	5M
9.	a)	Solve $(x^2-yz)p+(y^2-zx)q=(z^2-xy)$	5M
	b)	Form the P.D.E by eliminating the arbitrary function ϕ from $z=(x+y)\,\phi(x^2-y^2)$	5M

OR

10.	a)	Solve $x^2p^2+y^2q^2=z^2$	5M
	b)	Solve $(x^2-y^2-z^2)p+2xyq=2zx$	5M
11.	a)	Find a Fourier series to represent $x-x^2$ from $x=-\pi$ to $x=\pi$	5M
	b)	Obtain the Half Range cosine series for $f(x)=\begin{cases}kx, & \text{if } 0\le x\le \frac{l}{2}\\ k(l-x), & \text{if } \frac{l}{2}\le x\le l\end{cases}$	5M

OR

12.	a)	Expand $f(x)=\left(\frac{\pi-x}{2}\right)^2$ as a Fourier series in $(0,\,2\pi)$	5M
	b)	Find Half Range sine series for $f(x)=\begin{cases}x, & \text{if } 0<x<\frac{\pi}{2}\\ \pi-x, & \text{if } \frac{\pi}{2}<x<\pi\end{cases}$	5M

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