Unit – IV

7\. a) Find $L\left[\frac{\cos at-\cos bt}{t}+t\sin at\right]$ 6

b) Express $f(t)=\begin{cases}\sin t & 0<t\le\pi\\ \sin 2t & \pi\le t\le 2\pi\\ \sin 3t & t>2\pi\end{cases}$

in terms of Unit step function and find its Laplace transform. 7

c) If f(t) is a periodic function with period T so that f(t+T)=f(t) for all values of t,

prove that $L\{f(t)\}=\frac{1}{1-e^{-sT}}\int_0^T e^{-sT} f(t)dt$ 7

8\. a) Find $(i)\ L^{-1}\left[\frac{s+2}{s^2-4s+13}\right]$ $(ii)\ L^{-1}\left[cot^{-1}\left(\frac{s}{2}\right)\right]$ 6

b) Find $L^{-1}\left[\frac{1}{(s^2+1)(s^2+9)}\right]$ using convolution theorem. 7

c) Using Laplace transform technique solve

$(D^3-3D^2+3D-1)y=t^2e^t$ given that $y(0)=1, y^{/}(0)=0, y^{//}(0)=-2$ 7

Unit – V

9\. a) Form a partial differential equation by eliminating arbitrary constants from $(x-a)^2+(y-b)^2+z^2=c^2$. 6

b) Solve $\frac{\partial^3 z}{\partial x^2\partial y}+18xy^2+\sin(2x-y)=0$. 7

c) Derive one dimensional wave equation. 7

10\. a) Form the partial differential equations by eliminating arbitrary function from $z=f(x+at)+g(x-at)$ 6

b) Solve $(x^2-yz)p+(y^2-zx)q=z^2-xy$. 7

c) Using the method of separation of variables, solve

$\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$ where $u(x,0)=6e^{-3x}$.

BT* Bloom's Taxonomy, L* Level

****

USN ☐☐☐☐☐☐☐☐☐☐

NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester B.E. (Credit System) Degree Examinations

April – May 2018

17MA201 – ENGINEERING MATHEMATICS – II

ition: 3 Hours

Max. Marks: 100

Note: *Answer* **Five full** *questions choosing* **One full** *question from* **each** *Unit.*

		Marks	BT*
	Unit – I		
a)	Solve $(xy^3+y)dx+2(x^2y^2+x+y^4)dy=0.$	6	L3
b)	Find the orthogonal trajectories of the family of confocal conics $\frac{x^2}{a^2}+\frac{y^2}{a^2+\lambda}=1,$ where λ is the parameter.	7	L4
c)	If the temperature of the air is 30^oC and the substance cools from 100^oC to 70^oC in 15 minutes, find when the temperature of the substance will be 40^oC.	7	L3
a)	Find the general and singular solution of $\sin px\cos y=\cos px\sin y+p.$	6	L3
b)	Solve $y=2px+y^2p^3.$	7	L3
c)	Uranium disintegrates at a rate proportional to the amount then present at any instant. If M_1 and M_2 grams of uranium are present at times T_1 and T_2 respectively, find the half-life of uranium.	7	L3
	Unit – II		
a)	Solve $\frac{d^2y}{dx^2}+\frac{dy}{dx}=x^2+2x+4.$	6	L3
b)	Using the method of variation of parameters solve: $(D^2+4)y=tan2x.$	7	L3
c)	Solve $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+y=logx.$	7	L4
a)	Solve $y^{//}-2y^{/}+2y=e^x\cos x$	6	L3
b)	Solve by the method of undetermined coefficients $(D^2+1)y=\sin x.$	7	L3
c)	A body weighing 10 kg is hung from a spring. A pull of 20 kg.wt. will stretch the spring to 10 cm. The body is pulled to 20 cm below the state of equilibrium position and then released. Find the displacement of the body from its equilibrium position at time t sec., the maximum velocity and the period of oscillation.	7	L4
	Unit – III		
a)	Evaluate $\int_0^{\infty} x^n e^{-a^2x^2} dx$ in terms of Gamma function.	6	L2
b)	Prove that $\beta(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$	7	L3
c)	Evaluate $\int_0^{\pi/2}\sqrt{tan\theta}\,d\theta$ in terms of Gamma function.	7	L2
a)	Change the order of integration in $I=\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} dydx$ and hence evaluate.	6	L4
b)	Find the area bounded by the curve $r^2=a^2\cos2\theta$ by using double Integration.	7	L3
c)	Find the volume of the solid generated by the revolution of the cardioids $r=a(1+cos\theta)$ about the initial line.	7	L3

P.T.O.

6. a) i) Define beta and Gamma functions.

ii) Evaluate $\int_0^\infty x^6 e^{-2x} dx$ in terms of Gamma functions. 6

b) Prove that $\beta(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ with usual notations. 7

c) Evaluate $\int_0^\infty e^{-x}\frac{\sin ax}{x}dx$ using differentiation under the integral sign. 7

Unit – IV

7. a) If $f(t)$ is a periodic function with period T so that $f(t+T)=f(t)$ for all values of t, Prove that $L\{f(t)\}=\frac{1}{1-e^{-sT}}\int_0^T e^{-st}f(t)dt$. 6

b) Express $f(t)=\begin{cases} t-1 & 0\le t<2 \\ 3-t & 2\le t<3 \\ 0 & t\ge 3 \end{cases}$ in terms of unit step function and then find its Laplace Transform. 7

c) Find the Laplace Transform of i) $e^{-t}\cos^2 t$ ii) $t^2 e^{-3t}\sin 2t$ 7

8. a) Find i) $L^{-1}\left\{\frac{e^{-3s}}{(s-4)^2}\right\}$ ii) $L^{-1}\left\{\frac{s^2}{(s+2)^3}\right\}$ 6

b) State Convolution theorem. Using the theorem find the inverse Laplace Transform of $\left\{\frac{s}{(s^2+a^2)^2}\right\}$ 7

c) Solve $x''(t)-4x'(t)+4x(t)=4e^{-2t}$; $x(0)=-1,\ x'(0)=4$ 7

Unit – V

9. a) Construct P.D.E by eliminating the constants a, b from

i) $z=(x^2+a)(y^2+b)$ ii) $2z=\frac{x^2}{a^2}+\frac{y^2}{b^2}$ 6

b) Solve by the method of separation of variables $\frac{\partial^2 z}{\partial x^2}-2\frac{\partial z}{\partial x}+\frac{\partial z}{\partial y}=0$ 7

c) With usual notations and assumptions derive one dimensional heat flow equation in the form $u_t=c^2\ u_{xx}$ 7

10. a) Form the P.D.E by eliminating the arbitrary function from $f(x^2+y^2,\ z-xy)=0$ 6

b) Solve $(y+z)p-(z+x)q=x-y$ by Lagrange's Method. 7

c) With usual notations and assumptions derive one dimensional wave equation in the form $u_{tt}=c^2\ u_{xx}$ 7

BT* Bloom's Taxonomy, L* Level

****

USN ☐☐☐☐☐☐☐☐☐☐

NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester B.E.(Credit System) Degree Examinations

Make up / Supplementary Examinations – July 2018

17MA201 – ENGINEERING MATHEMATICS-II

tion: 3 Hours

Max. Marks: 100

Note: Answer ***Five full*** *questions choosing* ***One full*** *question from* ***each Unit.***

Unit – I

	Marks	BT*
a) Solve $y\,e^{xy}\,dx+(x\,e^{xy}+2y)\,dy=0$	6	L*2
b) Find the orthogonal trajectories of $r^2=a^2\cos 2\theta$ where a is a parameter.	7	L3
c) Suppose water at a temperature $100^\circ C$ cools to $80^\circ C$ in 10 minutes, in a room maintained at a temperature of $30^\circ C$, find when the temperature of water will become $40^\circ C$	7	L4
a) Find the general and singular solution of $y=px-\sqrt{1+p^2}$	6	L2
b) Solve the non-linear first order differential equation $P^3+2xP^2-y^2P^2-2xy^2P=0$	7	L4
) Solve $y(1+xy)dx+x(1-xy)dy=0$	7	L3

Unit – II

	Marks	BT*
) Solve $(D^2+3D+2)y=e^{-2x}-1$	6	L2
) By using the method of variation of parameter solve, $(D^2-4D+4)y=xe^{2x}$	7	L3
) A spring is such that 1.96 Kg weight stretches it 19.6 cms. an impressed force $\frac{1}{2}\cos 8t$ is acting on the spring. If the weight is started from the equilibrium point with an imparted upward velocity of 14.7cms per sec. determine the position of the weight as a function of time.	7	L4
Solve $(D^3-D)y=4\cos x+2e^x$	6	L2
Solve $(D^2+D-2)y=x+\sin x$, by the method of undetermined coefficients.	7	L4
. Solve $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}+2y=10\left(x+\frac{1}{x}\right)$	7	L3

Unit – III

	Marks	BT*
Change the order of integration and hence evaluate the following double integral $\int_0^\infty\int_x^\infty \frac{e^{-y}}{y}\,dydx$	6	L2
) Find the area bounded by the leminiscate $r^2=a^2\cos 2\theta$.	7	L3
) Evaluate $\int_0^a\int_0^x\int_0^{x+y} e^{x+y+z}\,dzdydx$	7	L4

P.T.O.