b) Solve $(D^2-2D+1)y=e^x \log x$ using the method of variation of parameters. 7 L2 3

c) A spring is such that 1.96kg weight stretches it 19.6cms, 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 14.7 cms per sec, determine the position of the weight as a function of time. 7 L3 3

Unit – IV

7. a) Find (i) $L\{e^{3t}\sin^2 5t - e^{2t}t^4\}$,

(ii) $L\{\int_0^t \frac{\cos t-\cos 2t}{t}dt\}$ 6 L1 4

b) Rewrite $f(t)=\begin{cases} t^2, 0<t<2 \\ 4, 2\le t<4 \\ 0, \quad t\ge 4 \end{cases}$ using unit step functions and find its Laplace transform. 7 L2 4

c) If $f(t)$ is a periodic function with period T, then prove that $L\{f(t)\}=\frac{1}{1-e^{-sT}}\int_0^T e^{-st}f(t)dt$. 7 L3 4

8. a) Find (i) $L^{-1}\{\frac{s+5}{s^2+2s+5}\}$, (ii) $L^{-1}\{\log(\frac{s^2+1}{s(s+1)})\}$ 6 L1 4

b) Using convolution theorem find $L^{-1}\{\frac{1}{(s^2+1)(s+1)}\}$ 7 L2 4

c) A voltage $E=E_0e^{-at}$ where E_0 and a are constants ,is applied at time t=0 to an LR circuit of inductance L and resistance R .Find the current at time t>0. 7 L3 4

Unit – V

9. a) Form partial differential equations by eliminating the arbitrary constants and arbitrary function from the equations

(i) $z=(x-a)^2+(y-b)^2+1$,

(ii) $x+y+z=f(x^2+y^2+z^2)$. 6 L1 5

b) Solve $(mz-ny)p+(nx-lz)q=ly-mx$ by Lagrange's method. 7 L2 5

c) Solve one dimensional heat equation $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$ by separation of variables. 7 L3 5

10. a) Solve $\frac{\partial^3 z}{\partial x^2\partial y}+20xy^2+\cos(3x+y)=0$ by direct integration. 6 L1 5

b) Solve (i) $p(1+q)=qz$, (ii) $p^2+q^2=x+y$. 7 L2 5

c) Solve $(x^2-y^2-z^2)p+(2xy)q=2xz$ by Lagrange's method. 7 L3 5

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

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

April – May 2019

18MA201 – ENGINEERING MATHEMATICS – II

ation: 3 Hours

Max. Marks: 100

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

			Marks	BT*	CO*	PO*
		Unit – I				
7	L3	a) Show that Newton – Raphson method has second order convergence.	6	L*3	1	2
7	L2	b) Find the missing terms in the following table using the method of finite differences				

x	0	1	2	3	4	5	6
y	5	11	22	40	-	140	-

	c) Apply Lagrange's method to find a root of f (x) =0 given that f(30)= -30,f(34)=-13, f(38)=3 ,f(42)=18.	7	L1	1	1
	a) Given values of x and y	7	L2	1	2

x	5	7	11	13	17
y	150	392	1,452	2,366	5,202

6	L3	Evaluate f(9) using Newton's divided difference formula.	6	L1	1	1
7	L2	b) Derive Newton's forward difference interpolation formula.	7	L3	1	2
		c) Use the method of false position to find the root of $x^3 - 2x - 5 = 0$ in (2, 3). Carry out three iterations.	7	L2	1	1
		Unit – II				
7	L2	a) Solve $(5x^4 + 3x^2y^2 - 2x\ y^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$.	6	L2	2	1
6	L2	b) If a body originally is at 80^0C cools down to 60^0C in 20 minutes, the temperature of air being 40^0C. Find the temperature of the body after 40 minutes from the original.	7	L2	2	1
7	L2	c) Solve $p^2 + 2py \cot x = y^2$.	7	L2	2	1
7	L3	a) Solve $(\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}})\frac{dx}{dy} = 1$	6	L2	2	1
6	L1	b) Solve $y - 2px = \tan^{-1}(xp^2)$.	7	L2	2	1
7	L2	c) Solve $(xy + x^2y^3) = \frac{dx}{dy}$.	7	L2	2	1
		Unit – III				
	L2	a) Solve $\frac{d^2y}{dx^2} + 36y = 5\sin 6x$.	6	L2	3	1
	L1	b) Solve $(D^2 + 2D + 2)y = x^2 + 5x + 1$.	7	L2	3	1
	L2	c) Solve $x\frac{d^2y}{dx^2} - \frac{2y}{x} = x + \frac{1}{x^2}$.	7	L2	3	1
	L2	a) Solve $(D^3 - 6D^2 + 11D - 6)\ y = e^{-2x} + e^{-3x}$.	6	L2	3	1

P.T.O.

c) A spring is such that 1.96kg weight stretches it 19.6cms, 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 14.7 cms. per sec., determine the position of the weight as a function of time. 7 L3

6. a) Solve $\frac{d^2y}{dx^2}+5\frac{dy}{dx}+6y=e^{-2x}\sin 2x.$ 6 L2

b) Solve $(D^2+1)y=\sec x\tan x$ by using the method of Variation of parameters. 7 L3

c) Solve $y'''-y'=2x+1+4\cos x+2e^x.$ 7 L2

Unit – IV

7. a) Express $f(t)=\begin{cases}0, & 0<t<1\\ t-1, & 1\ t<2\\ 1, & t\geq 2\end{cases}$ in terms of unit step function and find its Laplace transform. 6 L3

b) Find the Laplace transform of i) $te^{-t}\sin 4t$ ii) $\int_0^t \frac{\sin t}{t}dt$. 7 L2

c) If f(t) is a periodic function with period T such that f(t+ T)= f(t) for all values of t then prove that $L\{f(t)\}=\frac{1}{1-e^{-sT}}\int_0^T e^{-st}f(t)dt$. 7 L2

8. a) Find i) $L^{-1}\left\{\log\left(\frac{s+a}{s+b}\right)\right\}$ ii) $L^{-1}\left\{\frac{4s+5}{(s+1)^2(s+2)}\right\}$. 6 L2

b) Find the inverse Laplace transform of $\frac{1}{(s^2+1)(s+1)}$ by using the Convolution theorem. 7 L2

c) Solve $x''(t)+4x'(t)+4x(t)=4e^{-2t}, x(0)=-1, x'(0)=4$ by the Laplace transform method. 7 L3

Unit – V

9. a) Form partial differential equation for $x+y+z=f(x^2+y^2+z^2)$ by eliminating the arbitrary functions. 6 L1

b) Solve $(x^2-y^2-z^2)p+(2xy)q=2xz$ by Lagrange's method. 7 L2

c) Solve one dimensional heat flow equation of the form $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$ by separation of variables. 7 L2

10. a) Solve $\frac{\partial^3 z}{\partial x^2\partial y}=\cos(2x+3y)$ by direct integration. 6 L1

b) Solve $x^2\frac{\partial u}{\partial x}+y^2\frac{\partial u}{\partial y}=0$ by the method of separation of variables. 7 L2

c) Solve the following non-linear partial differential equations
i) zpq =p+q ii) $p^2+q^2=x+y$ 7 L2

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

Make up / Supplementary Examinations – July 2019

18MA201/17MA201 – ENGINEERING MATHEMATICS - II

Time: 3 Hours Max. Marks: 100

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

		Marks	BT*	CO*	PO*
	Unit – I				
L2	Show that the first difference of a polynomial of n^{th} degree is another polynomial of degree (n-1). Hence show that the n^{th} difference is a constant.	6	L*2	1	1
L3	Using Newton- Raphson method find the root of $x^4 - x = 10$ near to $x_0 = 2$ correct to three decimal places. Carry out three iterations.	7	L3	1	2
L3	Using Lagrange's formula find f(11) from the following data				

x	2	5	8	14
y=f(x)	94.8	87.9	81.3	68.7

		7	L2	1	2
L2	Use Newton's divided difference formula to find f(4), given the data				

x	0	2	3	6
f(x)	-4	2	14	158

L2		6	L2	1	2
L3	The area (A) of a circle corresponding to the diameter(D) is given below.				

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

L1	Find the area corresponding to the diameter 105 by using suitable interpolation formula.	7	L2	1	2
L2	Use the method of false position to find the root of the equation $\cos x = xe^x$ in (0,1). Carry out four iterations.	7	L3	1	2
	Unit – II				
	Solve $2\frac{dy}{dx}\cos x + 4y\sin x = \sin 2x$ given that $y\left(\frac{\pi}{3}\right) = 0$.	6	L2	2	2
L2	Solve $\left(y^2 e^{xy^2} + 4x^3\right)dx + \left(2xye^{xy^2} - 3y^2\right)dy = 0$.	7	L2	2	2
	The law for the decay of radio active materials states that disintegration at any instant is proportional to the amount of material present. If 30% of the radio active substance disappeared in 10 days, find how long will it take for 90% of it to disappear.	7	L2	2	2
L1					
a)	Solve $\left(x\frac{dy}{dx}\right)^2 + xy\frac{dy}{dx} - 6y^2 = 0$.	6	L2	2	2
b)	Solve $p^3 - 4xyp + 8y^2 = 0$.	7	L2	2	2
L2	c) Find the general and singular solutions of the equation $\sin(px - y) = p$.	7	L2	2	2
L2	**Unit – III**				
a)	Solve $[4D^2 - 1]y = e^{x/2} + 12e^x + 4$.	6	L2	3	2
b)	Solve $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 12y = x^3 \log x$.	7	L2	3	2

P.T.O.