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

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

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

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

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

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

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

c) A voltage $E = E_0 e^{-at}$ 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

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

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

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

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

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

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

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

C

USN ☐☐☐☐☐☐☐☐☐☐

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.***

Unit – I

Marks BT* CO* PO*

a) Show that Newton – Raphson method has second order convergence. 6 L*3 1 2

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	-

7 L1 1 1

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 L2 1 2

a) Given values of x and y

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

Evaluate f(9) using Newton's divided difference formula. 6 L1 1 1

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

) Solve

$$(5x^4+3x^2y^2-2x\ y^3)dx+(2x^3y-3x^2y^2-5y^4)dy=0.$$

6 L2 2 1

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

Solve $p^2+2py\cot x=y^2$. 7 L2 2 1

Solve $\left(\frac{e^{-2\sqrt{x}}}{\sqrt{x}}-\frac{y}{\sqrt{x}}\right)\frac{dx}{dy}=1$ 6 L2 2 1

Solve $y-2px=\tan^{-1}\left(xp^2\right)$. 7 L2 2 1

Solve $(xy+x^2y^3)=\frac{dx}{dy}$. 7 L2 2 1

Unit – III

Solve $\frac{d^2y}{dx^2}+36y=5\sin 6x$. 6 L2 3 1

Solve $(D^2+2D+2)y=x^2+5x+1$. 7 L2 3 1

Solve $x\frac{d^2y}{dx^2}-\frac{2y}{x}=x+\frac{1}{x^2}$. 7 L2 3 1

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 $(D^2+1)y=secxtanx$ by using the method of Variation of parameters. 7 L3

c) Solve $y''-y'=2x+1+4cosx+2e^x.$ 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) $\int_0^t \frac{sint}{t}dt.$ 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 L

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 L

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

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 L

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

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 L

c) Solve the following non-linear partial differential equations

i) zpq =p+q ii) $p^2+q^2=x+y$ 7 L

T* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

****

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 2019

18MA201/17MA201 – ENGINEERING MATHEMATICS - II

: 3 Hours

Max. Marks: 100

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

Unit – I

Marks BT* CO* PO*

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

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

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

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

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

6 L2 1 2

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

Find the area corresponding to the diameter 105 by using suitable interpolation formula. — 7 L2 1 2

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

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

Solve $\left(x\frac{dy}{dx}\right)^2 + xy\frac{dy}{dx} - 6y^2 = 0$. — 6 L2 2 2

Solve $p^3 - 4xyp + 8y^2 = 0$. — 7 L2 2 2

Find the general and singular solutions of the equation $\sin(px - y) = p$. — 7 L2 2 2

Unit – III

Solve $[4D^2 - 1]y = e^{x/2} + 12e^x + 4$. — 6 L2 3 2

Solve $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 12y = x^3\log x$. — 7 L2 3 2

P.T.O.