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NMAM INSTITUTE OF TECHNOLOGY, NITTE

Off-Campus Centre of Nitte (Deemed to be University)

I Sem B.Tech. (CBCS) Mid Semester Examinations - II, November 2022

uration: 1 Hour

EE1001-1 – BASIC ELECTRICAL ENGINEERING

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

Unit – I

			Marks	BT*	CO*	PO*
.	a)	State and explain (i) self induced emf (ii) mutually induced emf (iii) Lenz's Law.	06	L*2	3	1,2
	b)	A 250 kVA, 11000 V / 400 V, 50 Hz single-phase transformer has 80 turns on the secondary. Calculate: (i) The approximate values of the primary and secondary currents; (ii) The approximate number of primary turns; (iii) The maximum value of the flux.	04	L3	3	1,2
2.	a)	Derive the emf equation of single phase transformer.	04	L2	3	1,2
	b)	The primary and secondary windings of a 500 kVA transformer have resistances of 0.42 Ω and 0.0019 Ω respectively. The primary and secondary voltages are 11000 V and 400V respectively and the core loss is 2.9 kW, assuming the power factor of the load to be 0.8. Calculate the efficiency on (a) full load; (b) half load.	06	L3	3	1

Unit – II

3.	a)	With neat diagram explain construction of DC machine.	06	L2	4	
	b)	Derive the emf equation of DC generator.	04	L3	4	
4.	a)	Prove that two wattmeter are sufficient to measure the three phase power in a balanced star connected system with the help of vector diagram.	06	L2	2	
	b)	A 4 pole lap wound DC generator has 672 conductors. It is driven at 1120 rpm. If the useful flux per pole is 21 mWb, Calculate the generated emf. Find the speed at which it is to be driven to generate the same emf with wave wound armature.	04	L3	4	

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

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I Sem B.Tech. (CBCS) Mid Semester Examinations - II, November 2022

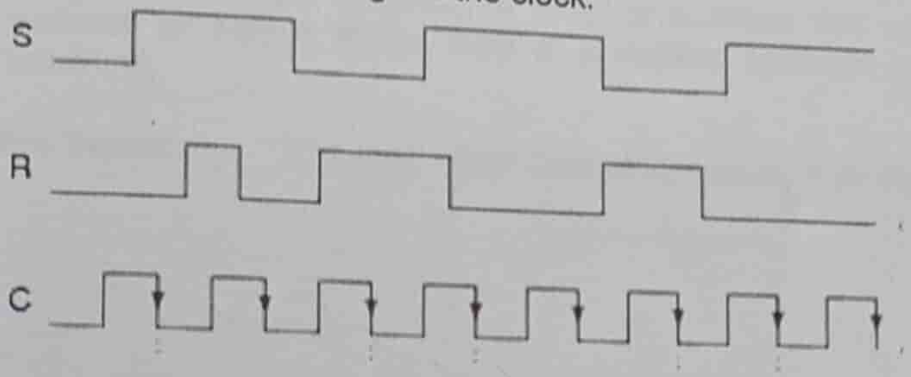
ration: 1 Hour

EC1002-1 – APPLIED DIGITAL LOGIC DESIGN

*Note: Answer any **One** full question from **each Unit.***

Max. Marks: 20

		Marks	BT*	CO*	PO*
	Unit – I				
a)	With a neat diagram illustrate the design of full adder using two half adders.	4	L*2	3	1
b)	Implement the function $F(A,B,C,D)=\sum m(6,7,9,10,13)$ using 8:1 multiplexer.	6	L3	3	2
a)	Implement u=a+bc' using 4:1 Mux.	5	L3	3	2
b)	Design a circuit using 3:8 decoder and OR gates that realizes following functions - $f1(A,B,C)=\sum m(0,4,6)$, f2=A'+AC.	5	L3	3	2
	Unit – II				
a)	Give the characteristic equation of T flip-flop and SR flip-flop.	5	L1	4	1
b)	Explain the operation of master-slave JK flip-flop with truth table and timing diagram.	5	L2	4	1
a)	Draw the output for the S, R and clock input as shown in below figure. Consider - ve edge of the clock.				



b)	Write a note on i. Latch ii. Flip-flop iii. Characteristic equation of D flip-flop	4 6	L3 L1	4 4	2 1

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

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech (CBCS) Mid Semester Examinations - II, April 2023

Duration: 1 Hour

MA1003-1 - DIFFERENTIAL EQUATIONS & LAPLACE TRANSFORMS

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Solve the differential equation $\frac{d^2y}{dx^2} + 4y = 2e^x \cos 2x$	5	L*1	2	1
	b)	Using the method of Variation of parameters solve the differential equation $(D^2 - 6D + 9)y = \frac{e^{3x}}{x^2}$	5	L2	2	1
2.	a)	Solve the differential equation $x^2y'' + xy' + y = 2\cos^2(\log x)$	5	L2	2	1
	b)	Solve $(D^2 - 1)y = (1 + x^2)e^x$	5	L1	2	1
		Unit – II				
3.	a)	If $L\{f(t)\} = F(s)$ then prove that $L\{t^n f(t)\} = (-1)^n \frac{d^n F(s)}{ds^n}$.	5	L3	3	1
	b)	Rewrite the following function using unit step function and find its Laplace transform: $f(t) = \begin{cases} \sin t & \text{if } 0 \le t < \pi/2 \\ \cos t & \text{if } t \ge \pi/2 \end{cases}$	5	L2	3	2
4.	a)	Find the Laplace transform of $e^{-3t} \sin 5t \sin 3t$.	5	L2	3	2
	b)	Find the Laplace transform of $\int_0^t \frac{\cos 3t - \cos 5t}{t} dt$.	5	L2	3	2

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

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

Off-Campus Centre of Nitte(Deemed to be University)

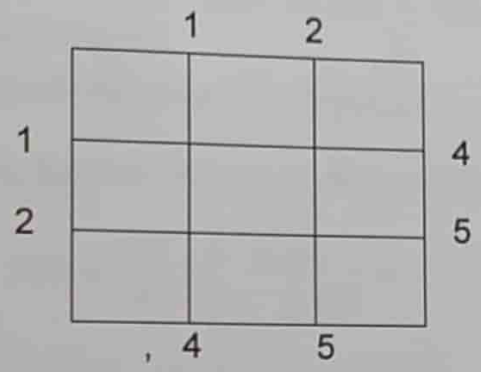
II Sem B.Tech. (CBCS) Mid Semester Examinations - II, April 2023

MA1004-1 – DISCRETE MATHEMATICS & NUMERICAL METHODS

ion: 1 Hour

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

		Marks	BT*	CO*	PO*
	Unit – I				
a)	Using Taylor's series method up to 4^{th} power of x, compute $y(0.2)$. Given $y' = 1 - 2xy, y(0) = 1$ and $h = 0.2$.	5	L*2	3	2
b)	Find a real root of $2x - log_{10}x - 7 = 0$ in $(3,4)$, using Regula falsi method. Carry out 3 iterations.	5	L3	3	1
a)	Prove that Newton-Raphson method has second order convergence.	4	L2	3	1
b)	Given that $\frac{dy}{dx} = 3x + y, y(0) = 1$ and $h = 0.1$. Find an approximate value of $y(0.2)$ by Runge-Kutta method of order 4.	6	L3	3	2
	Unit – II				
a)	Solve $u_{xx} + u_{yy} = 0$ for the square mesh with the boundary values as shown below: 	5	L3	4	2
)	Find the solution of the equation $u_{xx} = 2u_t$ with $u(0,t) = u(4,t) = 0$ and $u(x,0) = x(4-x)$, taking $h = 1, k = 1$. Find the values up to $t = 3$.	5	L1	4	2
)	Solve the PDE $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square with sides $x = 0 = y$; $x = 3 = y$ with $u = 0$ on the boundary and $h = 1$.	5	L3	4	2
)	Evaluate the pivotal values of the equation $u_{tt} = u_{xx}$, taking $h = k = 0.2$ up to $t = 0.4$. The boundary conditions are $u(0,t) = u(1,t) = 0$, $u_t(x,0) = 0$ & $u(x,0) = \frac{1}{2}x(1-x)$.	5	L1	4	2

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Off-Campus Centre of Nitte(Deemed to be University)

II Sem B.Tech. (CBCS) Mid Semester Examinations - II, April 2023

MA1004 -1 – DISCRETE MATHEMATICS & NUMERICAL METHODS

Duration: 1 Hour

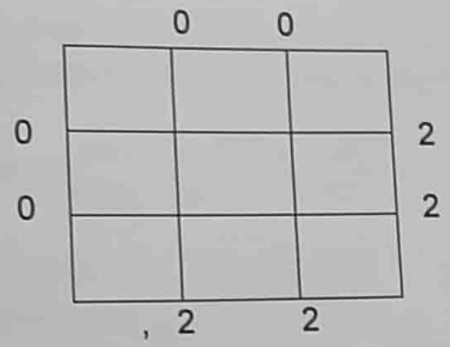
Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

Unit – I

			Marks	BT*	CO*	PO*
1.	a)	Prove that Newton-Raphson method has second order convergence.	4	L*2	3	1
	b)	Given that $\frac{dy}{dx} = x^2 + y, y(0) = 1$ and $h = 0.05$. Find an approximate value of $y(0.1)$ by modified Euler's method. Carry out 2 iterations in each step.	6	L3	3	2
2.	a)	Using Taylor's series method up to 4^{th} power of x, compute $y(0.1)$. Given $y' = x^2y - 1, y(0) = 1$ and $h = 0.1$.	5	L2	3	2
	b)	Find a real root of $cosx - 2x + 3 = 0$ in $(1,2)$, using Regula falsi method. Carry out 3 iterations.	5	L3	3	1

Unit – II

3.	a)	Solve $u_{xx} + u_{yy} = 0$ for the square mesh with the boundary values as shown below: 	5	L3	4	2
	b)	Find the solution of the equation $u_t = 4u_{xx}$ with $u(0,t) = u(8,t) = 0$ and $u(x,0) = 4x - \frac{1}{2}x^2$, taking $h = 1, k = \frac{1}{8}$. Find the values up to $t = \frac{3}{8}$.	5	L1	4	2
4.	a)	Solve the PDE $\nabla^2 u = -81xy, 0 < x, y < 1$, $h = k = \frac{1}{3}$, $u(0,y) = 0 = u(x,0), u(1,y) = 100 = u(x,1)$.	5	L3	4	
	b)	Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$, taking $h = 1, k = \frac{1}{4}$ up to $t = 0.75$. The boundary conditions are $u(0,t) = u(5,t) = 0$, $u_t(x,0) = 0$ & $u(x,0) = x^2(5-x)$.	5	L1	4	

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

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Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech (CBCS) Mid Semester Examinations - II, April 2023

MA1003-1 - DIFFERENTIAL EQUATIONS & LAPLACE TRANSFORMS

Duration: 1 Hour

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Solve the differential equation $\frac{d^2y}{dx^2} + 4y = 2e^x \cos 2x$	5	L*1	2	1
	b)	Using the method of Variation of parameters solve the differential equation $(D^2 - 6D + 9)y = \frac{e^{3x}}{x^2}$	5	L2	2	1
2.	a)	Solve the differential equation $x^2y'' + xy' + y = 2\cos^2(logx)$	5	L2	2	1
	b)	Solve $(D^2 - 1)y = (1 + x^2)e^x$	5	L1	2	1
		Unit – II				
3.	a)	If $L\{f(t)\} = F(s)$ then prove that $L\{t^n f(t)\} = (-1)^n \frac{d^n F(s)}{ds^n}$.	5	L3	3	1
	b)	Rewrite the following function using unit step function and find its Laplace transform: $f(t) = \begin{cases} \sin t & \text{if } 0 \le t < \pi/2 \\ \cos t & \text{if } t \ge \pi/2 \end{cases}$	5	L2	3	2
4.	a)	Find the Laplace transform of $e^{-3t} \sin 5t \sin 3t$.	5	L2	3	2
	b)	Find the Laplace transform of $\int_0^t \frac{\cos 3t - \cos 5t}{t} dt$.	5	L2	3	2

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

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II Sem B.Tech (CBCS) Mid Semester Examinations - II, April 2023

EE1001-1 – BASIC ELECTRICAL ENGINEERING

Duration: 1 Hour

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

Unit – I

			Marks	BT*	CO*	PO*
1.	a)	State and explain Faradays laws of Electromagnetic Induction.	04	L*2	03	1,2
	b)	In a 50 KVA, 1100/220 V single phase transformer the iron and full load copper losses at full load are 350W & 425W respectively. Find (i) Efficiency at full load unity p.f (ii) The load at which maximum efficiency occurs iii) Max efficiency at unity power factor	04	L3	03	1,
	c)	List the various losses in a transformer.	02	L1	03	1,
2.	a)	What is an autotransformer? List its advantages and applications.	04	L1	03	1,
	b)	Derive the emf equation of a single-phase transformer	04	L2	03	1,
	c)	Define self and mutually induced emf.	02	L1	03	1,

Unit – II

3.	a)	With a suitable diagram explain the construction of synchronous machine.	05	L2	04	1
	b)	A six pole, lap-wound 230V series motor has the following data: Number of armature conductors = 800, flux/pole = 0.04Wb, total motor resistance = 0.5Ω, iron and friction losses = 1.5kW. If current taken by the motor is 60A, find: i. Total torque ii. Useful torque at the shaft iii. Power output.	05	L3	04	
4.	a)	Draw and explain the torque Vs armature current characteristics of DC shunt motor.	03	L2	04	
	b)	Derive the emf equation of the DC generator	04	L2	04	
	c)	A 12 pole 500 rpm star connected alternator has 48 slots, with 15 conductors/slot, the flux/pole is 0.02 Wb. Assume unity distribution factor and winding factor as 0.97. Calculate line EMF.	03	L3	04	

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

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II Sem B.Tech (CBCS) Mid-Semester Examinations - II, April 2023

EC1002-1 – APPLIED DIGITAL LOGIC DESIGN

: 1 Hour

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

	Marks	BT*	CO*	PO*
Unit – I				
Show the implementation of a full adder using two half adders and OR gate with relevant equations.	6	L*2	3	1
Implement the following functions using a 4-to-16-line decoder. i. $f_1(w,x,y,z) = \bar{w}xy + xyz + \bar{w}xy\bar{z}$ ii. $f_2(w,x,y,z) = \bar{w}xyz + yz + wxy\bar{z}$	4	L3	3	1
With a neat diagram and relevant example explain the working of 4-bit parallel adder/subtractor.	6	L2	3	1
Implement the function $f(x,y,z) = \prod M(0,2,4,5)$ using i. 8:1 Mux ii. 4:1 Mux by considering x and z as select lines	4	L3	3	1
Unit – II				
With function table and timing diagram explain the working of Positive edge triggered D Flip-Flop.	6	L2	4	1
Explain one-bit comparator using truth table and logic diagram. Also, implement a 1-bit comparator using a 2-to-4-line decoder.	4	L3	3	1
Explain the operation of Master-Slave JK flip-flop using NAND only with reference to the clock signal.	6	L2	4	1
With the help of the function table, explain the working of the SR flip-flop and show how SR flip-flop can be modified to D flip-flop.	4	L3	4	1

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

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II Sem B.Tech (CBCS) Mid-Semester Examination - II, April 2023

Duration: 1 Hour

CS1003-1 – BASICS OF PYTHON PROGRAMMING

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Create a program that takes input for a list of numbers and returns a new list with all the duplicates removed.	5	L*3	3	1
	b)	Explain the concepts of tuples and lists. Illustrate with examples	5	L2	3	1
2	a)	Develop a Python program to count the number of times an item appears in the list.	5	L3	3	1
	b)	Design a program that declares a dictionary of students with name and USN as key. Read the value for these fields and display the same.	5	L3	3	1
		Unit – II				
3.	a)	Develop a function that takes in a list of numbers and returns the sum of all the even numbers in the list	5	L3	4	1
	b)	Explain the concept of OOP with the help of syntax for classes and objects.	5	L1	4	1
4.	a)	Design a function that takes in two lists and returns a new list containing all the elements common to both lists.	5	L3	4	1
	b)	Explain the three different types of parameter passing methods for functions in python.	5	L2	4	1

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

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Unit – II

4.	a)	With a neat logic diagram, function table and timing diagram explain the operation of pulse triggered JK flip-flop.	8	L2
	b)	Implement the following functions using appropriate decoder with minimum number of gate inputs.		
		i) $F1(w,x,y) = \sum m\,(1,3,5,6,7)$		
		ii) $F2(w,x,y) = \prod M(1,2,3,5,6,7)$	4	L3
	c)	Differentiate between		
		i) Combinational Logic circuits and sequential logic circuits		
		ii) Latch and Flip flop	4	L2

SEE May-June 2023

5. a) Define Half and Full Adder. Design the circuit of Half and Full Adder with truth table and write the logic diagram. 8 L
   b) Realize the following Boolean function using an appropriate multiplexer and external gates with a, b as select lines.

$$f(a,b,c) = \sum m(0,1,5,6,7)$$

   c) What are the characteristic equations of Flip flop? Obtain the characteristic equation of JK Flip Flop 4 L

6. a) With neat logic diagram and function table explain the positive edge triggered D Flip flop and also write its timing diagram. 8 L
   b) Design a combinational logic circuit to compare the two ,1 bit numbers. 4 L
   c) Explain the operation of 4-bit parallel adder using full adders with an example. 4 L

Unit – II

4.	a)	Write three Python functions to find the Mean, Variance, and Standard Deviation for a list of numbers. Read the numbers for the list from the user.	8	L3	3	1
	b)	Develop a Python program to perform a linear search for a given Key number in the list and report Success or Failure. Read the values for the list from the user.	8	L3	3	1
5.	a)	Develop a recursive python function to find the factorial of a given number. Read the input from the user.	8	L3	3	1
	b)	Discuss the relation between tuples and lists, tuples, and dictionaries in detail.	8	L2	3	1

6. a) Develop an Object-oriented Python Program to input information of student as given below: SEE May-June 2023
   a. Name
   b. Registration Number
   c. Total and average Marks
   Write a function to display the values after reading all the values.
   b) Explain the different types of parameter passing methods. Illustrate with suitable examples. 8

...triangle. 5 L2 2 2

Unit – II

4.	a)	Derive the emf equation of a transformer.	4	L1	1	1
	b)	Derive the expression for the armature torque of a DC motor.	5	L3	3	1
	c)	A 16-pole star-connected alternator has 144 slots and 10 conductors per slot. The flux per pole is 30 mWb and the speed is 375 rpm. Find the frequency, the phase emf and line emf. Assume that the winding is concentrated and full-pitched ($K_d = K_p = 1$).	5	L3	4	1
5.	a)	Prove that the efficiency of a transformer is maximum when its Copper loss equals its iron loss.	6	L2	4	2
	b)	Discuss the three characteristics of a DC shunt motor.	6	L3	3	1,2
	c)	Describe the working principle of a 3-phase synchronous motor.	5	L2	4	1
6.	a)	Obtain the expression for the frequency of the induced emf of an alternator in terms of number of poles and rpm.	5	L2	4	1
	b)	A 4-pole DC generator has a lap-wound armature with 50 slots with 16 conductors per slot. The useful flux per pole is 30 mWb. Determine the speed at which the machine must be driven to generate an e.m.f. of 240 V.	4	L3	4	1
	c)	A 250-kVA, single-phase transformer has an efficiency of 96 % on full load at 0.8 power factor lagging and also on half load 0.8 power factor lagging. Find its iron loss and full-load copper loss.	6	L2	4	2

Unit – III

			6	L2	3	2

c) Solve $\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6x = 0$ given $x(0) = 0, \frac{dx}{dt}(0) = 15$ 4 L

Unit – II

4. a) If $L\{f(t)\} = F(s)$ then prove that $L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}(F(s))$. 6 L

b) Use partial fraction method to find inverse Laplace transform of $\frac{2s+3}{(s-1)(s+2)^2}$. 6 L

c) Find Laplace transform of $e^{-3t}(2cos5t - 3sin5t)$. 4 L2 3

5. a) If f(t) is a periodic function with period T, then prove that $L\{f(t)\} = \frac{\int_0^T e^{-st} f(t)dt}{1-e^{-sT}}$ 6 L3

b) Using Convolution theorem find the inverse Laplace transform of $\frac{1}{s^2(s-1)}$. 6 L2

c) Find the Laplace Transform of $\int_0^t e^{-t} cost\, dt$. 4 L2

6. a) Rewrite the following function using unit step function and find its Laplace transform $f(t) = \begin{cases} sint, & 0 < t \leq \frac{\pi}{2} \\ cost, & t > \frac{\pi}{2} \end{cases}$. 6 L2

b) Using Laplace transform method, solve the differential equation $x''(t) + 4x'(t) + 4x(t) = 4e^{-2t}; x(0) = -1, x'(0) = 4$. 6 L3

c) Find $f(t)$ if $L\{f(t)\} = \frac{e^{-3s}}{(s-4)^2}$. 4 L2

degree. graph has

Unit – II

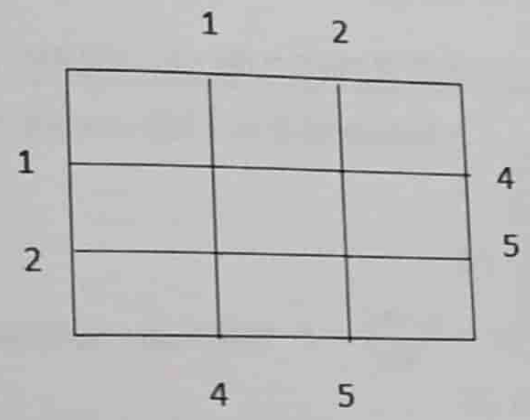
4.	a)	Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$ taking h=1 up to t=1.25, the boundary conditions are $u(0,t) = u(5,t) = 0;\quad u(x,0) = x^2(5-x)$ & $u_t(x,0) = 0.$	4	L1	2
	b)	Find the solution of the parabolic equation $u_{xx} = 2u_t \ when \ u(0,t) = u(4,t) = 0,$ & $u(x,0) = x(4-x)$ taking h=1. Find the values up to t = 5.	6	L3	4
	c)	Use the method of false position to find the root of the equation $xlog_{10}x - 1.2 = 0 \ in \ (2,3)$. Carry out three iterations.	6	L3	
5.	a)	Using Modified Euler's method find an approximate value of y, $when \ x = 0.1, \ taking \ h = 0.05$ for $y' = x^2 + y;\ y(0) = 1.$	4	L3	
	b)	Solve $\nabla^2 u = -81xy, 0 < x,y < 1, \ h = 1/3 = k,$ $u(0,y) = 0 = u(x,0),\quad u(1,y) = 100 = u(x,1).$	6	L3	
	c)	Show that Newton–Raphson method has second order convergence.	6	L3	
6.	a)	Solve the Laplace equation $u_{xx} + u_{yy} = 0$ for $0 < x < 1,\ 0 < y < 1.$ Given that $u(x,0) = u(0,y) = 0, u(x,1) = 6x;\quad 0 < x \leq 1$ and $u(1,y) = 3y,\quad 0 < y < 1.$ Divide the region into 9 square meshes.	4	L1	
	b)	Using fourth order Runge-Kutta method solve the following initial value problem: $y' = x + y^2, y(0) = 1.$ Find y(0.2) taking h=0.1	6	L3	
	c)	Using Taylor's series method compute y correct to 3 decimal places, $at \ \ x = 0.1, \ given \ y' = x - y^2, \ y(0) = 1,$ h=0.1.	6	L3	
			4	L3	

Unit – III

Obtain the Fourier series of f (x) = e^{-x}, 0 < x < 2π. 6 L

Unit – II

a)	Apply the Taylor's series method up to 4^{th} power of h to find $y(0.1)$ given that $y' = x - y^2, y(0) = 1$ & $h = 0.1$. Compute the solution up to 4 decimal places.	6	L2	3
b)	Show that the Newton-Raphson method has second order convergence.	6	L2	3
c)	Solve the equation $u_{xx} + u_{yy} = 0$ for the mesh with boundary values as shown below			



a)	Solve the Poisson's equation $\nabla^2 u = 8x^2y^2$ over the square with sides $x = 0 = y$; $x = 3 = y$ with $u = 0$ on the boundary and mesh length equal to one.	6	L2	
b)	Find the solution of the parabolic equation $u_{xx} = 2u_t$ when $u(0,t) = u(4,t) = 0$ & $u(x,0) = x(4-x)$, taking $h = 1$. Find the values up to $t = 5$ using Bendre Schmidt recurrence relation.	6	L3	
c)	Using 4^{th} order Runge-Kutta method find $y(0.2)$, given $y' = y - x, y(0) = 2$ & $h = 0.2$.	4	L2	
a)	Find the root of the equation $cosx = 3x - 1\ in\ [0,1]$ by Regula- falsi method correct to 3 decimal places. Carry out 3 iterations.	6	L3	
b)	Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$ taking $h = 1$, $k = 0.25$ up to $t = 1$. The boundary conditions are $u(0,t) = u(5,t) = 0$; $u_t(x,0) = 0$ and $u(x,0) = x^2(5-x)$.	6	L2	
c)	Using Modified Euler's method, find $y(20.2)$ given that $\frac{dy}{dx} = log_{10}\left(\frac{x}{y}\right)$ with $y(20) = 5, h = 0.2$.	4	L	

Unit – II

a) If $f(t)$ is a periodic function with period T, then prove that $L\{f(t)\} = \int_0^T e^{-st} f(t)dt/(1 - e^{-sT})$. 6

b) Using partial fraction method, find the inverse Laplace transform of $(3s + 4)/[(s + 3)(s - 2)^2]$. 6

c) Find the Laplace transform of $e^{-2t}(3\cos 2t - 5\sin 2t)$. 4

a) If $L\{f(t)\} = F(s)$ then prove that $L\{t^n f(t)\} = (-1)^n \frac{d^n F}{ds^n}$. 6

b) Rewrite the following function using unit step function and find its Laplace transform : $f(t) = \begin{cases} t^2 & \text{if} \quad 0 \le t < 3 \\ 4t & \text{if} \quad t \ge 3 \end{cases}$. 6

c) Find the inverse Laplace transform of $\frac{3}{s} - 4\frac{e^{-s}}{s^2} + 4\frac{e^{-3s}}{s^2}$. 4

a) Using convolution theorem, find the inverse Laplace transform of $\frac{1}{s^2(s+1)^2}$. 6

b) Using Laplace transform, solve the following differential equation: $x''(t) + x(t) = 6\cos 2t$, $x(0) = 3$ and $x'(0) = 1$. 6

c) Find the Laplace transform of $\frac{(1-\cos 2t)}{t}$

phase star connected balanced system. are sufficient to

Unit – II

a)	Define (i) self-induced emf (ii) self-inductance (iii) mutually induced emf and (iv) mutual inductance.	8	L4	
b)	With a neat sketch, explain working principle of a single-phase transformer.	4	L1	
c)	A 240 V, 4 pole shunt motor running at 1000 rpm gives 15 HP with an armature current of 50 A and field current of 1 A. The armature winding is wave connected and has 540 conductors. Its resistance is 0.1 Ω and drop at each brush is 1V. Find: (i) Useful torque, (ii) Total torque, (iii) Useful flux per pole.	4	L2	
a)	In a 50 KVA, 1100/220 V single phase transformer the iron loss and full load copper losses are 350W & 425W respectively. Find (i) Efficiency at full load unity power factor, (ii) The load at which maximum efficiency occurs, (iii) Max efficiency at UPF.	8	L3	
b)	With a neat diagram explain the construction of DC machine.	8	L3 L2	
a)	What are the losses occurring in a transformer when it is excited by AC source. Also define the efficiency and derive the condition for maximum efficiency of a single-phase transformer.	8	L3	
b)	With suitable notations, derive the expression for EMF induced in an alternator.	4	L3	
c)	A 12 pole 500 rpm star connected alternator has 48 slots, with 15 conductors/slot, the flux/pole is 0.02 Wb. Assume distribution factor as 1 and winding factor as 0.97. Calculate the line value of EMF.	4	L	

```
print(i)
i += 1
```

Unit – II

a)	Outline any four list operations with example.	2	L
b)	Write a python program to perform binary search for unsorted elements by designing two separate functions to perform search and sort. Hint: sort() built-in function can be used.	8	L
a)	i. Define Dictionaries in python with example.	8	L
	ii. A list contains tuples containing roll number, names and age of student. Write a python program to gather all roll numbers, names and age from the source list into list1, list2 and list3 respectively.		
b)	What is the output of the following program?	8	L

```
tuple = {}
tuple[(1,2,4)] = 8
tuple[(4,2,1)] = 10
tuple[(1,2)] = 12
_sum = 0
for k in tuple:
    _sum += tuple[k]
print(len(tuple) + _sum)
```

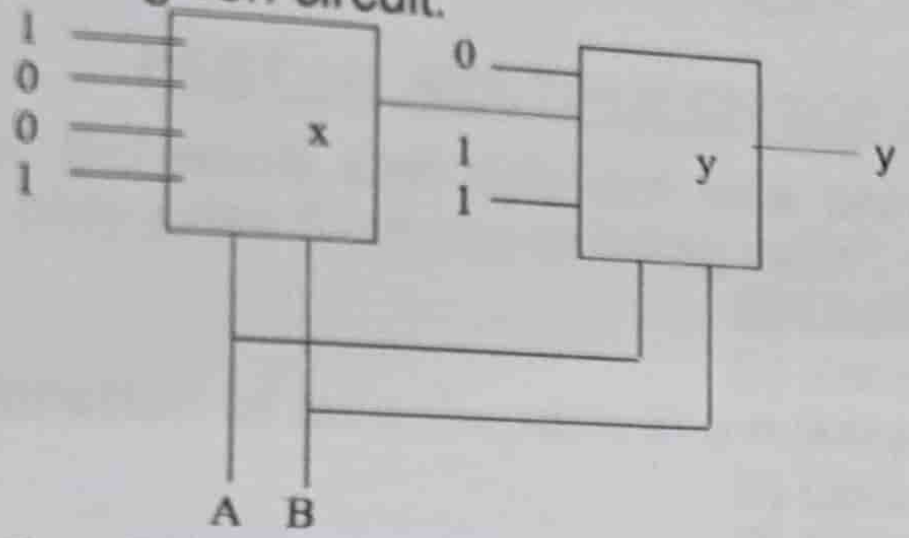
c)	Define functions in python. Compare and contrast actual and formal arguments in python.	5	
a)	Construct a recursive function in python to obtain sum of first 10 even numbers.	5	
b)	Compare and contrast difference between list and tuples.	6	
c)	Explain add and delete operation on a dictionary with an example.	5	

Unit – III

gates only.

Unit – II

a)	What is magnitude comparator? Design 1-bit comparator using logic gates.	4	L2
b)	Analyze output Y of the given circuit.		



c)	Implement the function $F(A,B,C)=\sum m(1,2,4,7)$ using i) 8:1 multiplexer, ii) 4:1 multiplexer.	4 8	L

a)	Implement the following functions using 3:8 Decoder. $F1 = A+BC$ $F2 = \sum m\ (3,5,7)$ $F3 = \prod M\ (3,5,7)$	4	
b)	Explain basic SR flip-flop by using NAND gates. What is the drawback of SR flip-flop? How JK flip-flop is obtained from SR flip-flop?	6	
c)	Implement u=ab+ac+bc using 4:1 Multiplexer.	6	

a)	With a neat diagram explain the working of 4-bit Ripple Carry Adder.	5
b)	Implement 1-bit comparator using a 2:4 decoder.	5
c)	How to convert JK flip-flop to D flip-flops with the help of state synthesis table? Show all the steps.	6

Unit – III