(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] FEBRUARY 2023

Paper Code: ES-201 ***Subject: Computational Methods***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt any five questions including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any. Scientific calculator is allowed.

Q1 (a) In the subtraction of 37.593621-37.584216, how many significance will be lost. **(1.5)**

(b) How many steps of the bisection algorithm are needed to compute a root of f(x) to full machine single precision on a 32-bit word length computer if a=16 and b=17. **(1.5)**

(c) Using Simpson's 1/3 rule compute the integral $\int_0^{\pi/2} \sqrt{\sin(x)}\,dx$ for n=4 with an accuracy to five decimal places. **(1.5)**

(d) Using Lagrange interpolation find the unique polynomial of degree 2, such that f(0)=1, f(1)=3, f(3)=55. **(1.5)**

(e) Define eigèn Values of a matrix and eigen values of the matrix **(1.5)**

(f) Define Cubic Spline function and write the conditions required for cubic spline interpolation **(1.5)**

(g) Solve IVP $\frac{dy}{dx} = x + y^2, y(0) = 1$ using Picard's method upto 2nd iterations. **(3)**

(h) Classify whether the equations are hyperbolic, elliptical or parabolic:
$(i) e^x u_{xx} + \cos y\, u_{xy} - u_{yy} = 0$
$(ii) u_{xx} + u_{yy} + u_x + \sin x\, u_y - u = x^2 + y^2$ **(3)**

UNIT – I

Q2 a) If the secant method is used on $f(x) = x^5 + x^3 + 3$ *with* $x_0 = -1$ *and* $x_1 = 1$, *what will be* x_8? **(8)**

b) If f(x) = 3x-cos(x)-1 and x_0= 0.6, what are x_1 and x_2 in the Newton iteration? **(7)**

Q3 a) Minimize the function f(x) = $4x^3 + x^2 - 7x + 14$ within the interval [0,1] using golden section method. **(7.5)**

b) Find minimum value of $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ using steepest decent method taking starting point x_0(0, 0). **(7.5)**

UNIT-II

Q4 a) Prove that $e^x = \left(\frac{\Delta^2}{E}\right) e^x . \frac{Ee^x}{\Delta^2 e^x}$ the interval of differentiation being unity. **(6.5)**

b) Construct a divided difference table for the function f(x) given in the following table and find the Newton divided difference interpolating polynomial of f(x)

x	1	3/2	0	2
y	3	13/4	3	5/3

Also find f(0.5). **(8.5)**

P.T.O.

ES201
P1/2

Q5 (a) If the integral $\int_0^{\pi} e^{\cos x} dx$ is to be computed with absolute error less than $\frac{1}{2} \times 10^{-3}$, and if we are going to use composite trapezoidal rule with a uniform partition, how many subintervals are needed? **(6)**

(b) Evaluate the definite integral $\int_0^1 e^{-x^2} dx$ using the basic Simpson's 1/3 rule and the basic Simpson's 3/8 rule carries five significant digits. Also, find the length of correctness in the significant decimal places (rounded) in both the rules. **(9)**

UNIT-III

Q6 (a) Show that the system of equations:

$$\begin{cases} x_1 + 4x_2 + \alpha x_3 = 6 \\ 2x_1 - x_2 + 2\alpha x_3 = 3 \\ \alpha x_1 + 3x_2 + x_3 = 5 \end{cases}$$

Possesses a unique solution when α=0, no solution when $\alpha \neq$ -1 and infinitely many solution when α =1. **(6)**

(b) Solve the system of linear equations:

$$\begin{cases} 0.0001x + y = 1 \\ x + y = 2 \end{cases}$$

Using Gauss elimination method in order to apply no pivoting and partial pivoting. Also analyse, how roundoff error effect the computation if the calculation carry at most five significant digits of precision (rounding). **(9)**

Q7 (a) Determine the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ using power series method taking starting eigen vector $X^{(0)} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$. **(6)**

(b) Determine the Cholesky factorization of the matrix A, where A is:

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix}$$ **(9)**

UNIT – IV

Q8 (a) Using Taylor's series method, compute y(0.2) to three decimal precision from $\frac{dy}{dx} = 1 - 2xy$ *given that* $y(0) = 0$. Compare the result with the exact result for the value of y at 0.2. **(7.5)**

(b) Consider the initial value problem $\begin{cases} \frac{dx}{dt} = 2 + (x - t - 1)^2 \\ x(1) = 2 \end{cases}$. Using Runge-Kutta method of 4th order find x(1.5) taking h=0.5 **(7.5)**

Q9 (a) Solve the initial value problem $\frac{dy}{dx} = 1 + xy^2, y(0) = 1$ and find y(0.4) using Milne's method, when it is given that: **(6)**

x	0.1	0.2	0.3
y	1.105	1.223	1.355

(b) Solve the partial differential equation $u_{xx} + u_{yy} = -81xy$, $0 < x < 1$, $0 < y < 1$ given that u(x,0)=0, u(0,y)=0, u(1,y)=100, u(x,1)=100 and h=1/3. **(9)**

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(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] FEBRUARY 2023

Paper Code: ETMA-201 ***Subject: Applied Mathematics-III (Batch: 2013 onwards)***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questions including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 (a) Prove that in the Fourier expansion of the function f(x) in

$[c, c+2\pi]\ \frac{1}{2}a_0 + \sum a_n \cos nx = \frac{1}{2}[f(x)+f(-x)]$ and $\sum b_n \sin nx = \frac{1}{2}[f(x)-f(-x)]$ where a_0, a_n and b_n are Fourier coefficients. **(3)**

(b) Find the difference equation corresponding to the family ofcurves $y = ax + bx^2$ **(3)**

(c) Find the inverse Z-transform of $F(z)$ given by $F(z) = \frac{z}{(z+4)(z+5)}$. **(3)**

(d) State the property of the function which is repeatedly applied in bisection method to find the root of the equation f(x)=0 also write the formula to find the number of iteration required for achieve an accuracy ε. **(3)**

(e) Using Simpson's 1/3 rule compute the integral $\int_0^1 \frac{1}{1+x^2}dx$ for n=4 with an accuracy to five decimal places. **(3)**

(f) Using Lagrange interpolation find the unique polynomial of degree 2, such that f(0)=1, f(1)=3, f(3)=55. **(3)**

(g) Solve $\frac{dy}{dx} = x + y^2, y(0) = 1$ using Picard's method upto 2nd iterations. **(3)**

(h) Find the Fourier Sine and Cosine Transform of $f(x) = \begin{cases} 1, & 0 < x < a \\ 0, & x > a \end{cases}$. **(4)**

UNIT – I

Q2 The function f(x) is given by $f(x) = \begin{cases} -\pi, -\pi < x < 0 \\ x, 0 < x < \pi \end{cases}$ Draw its graph and find its Fourier series and hence prove that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots \ldots = \frac{\pi^2}{8}$. **(12.5)**

Q3 (a) Find the first three Fourier coefficients for the function $f(\theta)$ given in the following table: **(6.5)**

θ^0	0	60	120	180	240	300	360
f(θ)	0.8	0.6	0.4	0.7	0.9	1.1	0.8

(b) Find the Fourier transform of $e^{-p|x|}, -\infty < x < \infty$ and write its Fourier integral representation, p>0. **(6)**

UNIT – II

Q4 (a) Solve $y_{n+2} + 2y_{n+1} + 4y_n = 0$ **(6)**

(b) Solve $y_{n+2} - 6y_{n+1} + 8y_n = 2^n + 6n$ **(6.5)**

Q5 (a) Find the inverse of $\frac{2z^2+3z}{(z+2)(z-4)}$. **(6)**

(b) Solve following difference equation Using z-transform: **(6.5)**
$y_{n+2} - 4y_{n+1} + 4y_n = 2^n$, *given that* $y_0 = 0, y_1 = 1$.

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ETMA 201
P1/2

UNIT-III

Q6 (a) What x_8 is? If Regula-falsi iterative method is applied over $f(x) = \cos x - xe^x \; with \; x_0 = 0 \; and \; x_1 = 1.$ **(6.5)**

(b) Using Gauss-Seidal method solve following given system of linear equations correct upto 4th decimal places:

$$\begin{matrix} 5x - & y + & z = 10 \\ 2x + & 8y + & -z = 11 \\ -x + & y + & 4z = 3 \end{matrix}$$, Starting with $\begin{bmatrix} x_0 \\ y_0 \\ z_0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ **(6)**

Q7 (a) Find $\Delta^n(e^x)$ the interval of differentiation being unity. **(5)**

(b) Form the divided difference table and define f(x) as a Newton divided interpolating polynomial in x for the following table and also estimate the value of f(1). **(7.5)**

X	-4	-1	0	2	5
y	1245	33	5	9	1335

UNIT – IV

Q8 (a) Evaluate the integral $I = \int_0^6 \frac{dx}{1+x^2}$ by employing (i) Trapezoidal rule (ii) Simpson's 1/3 rule and (iii) Simpson's 3/8 rule. **(6)**

(b) From the following data, find the maximum or minimum value of y: **(6.5)**

x	0.60	0.65	0.70	0.75
y	0.6221	0.6155	0.6138	0.6170

Q9 (a) Using Taylor's series method, compute y(0.2) to three decimal precision from $\frac{dy}{dx} = 1 - 2xy \; given \; that \; y(0) = 0$. Compare the result with the exact result for the value of y at 0.2. **(6.5)**

(b) Consider the initial value problem $\begin{cases} \frac{dx}{dt} = 1 + t^2 \\ x(0) = 0 \end{cases}$. Using Runge-Kutta method of 4th order find x(0.4) taking h=0.2 **(6)**

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(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] FEBRUARY 2023

Paper Code: ETEC-205 ***Subject: Switching Theory & Logic Design***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1. This question contains 10 parts and carries equal weightage. This question is compulsory. **(2.5X10=25)**

(a) Simplify the following function using K-map.
F(A,B,C,D) = Σ(1,3,4,5,6,11,13,14,15)

(b) Convert $(24.875)_{10}$ to $(?)_{16}$

(c) Write a short note on bridging faults

(d) Draw a neat diagram of Johnson Counter

(e) Evaluate: $(88.7)_{10} + (265.8)_{10} = (?)_{10}$

(f) State the reason why Gray code is called reflected code.

(g) State the difference between combinational and sequential logic circuits

(h) State the characteristic features of TTL logic family

(i) What are the limitations of Moore models

(j) What is the difference between PLA and PAL?

UNIT-I

Q2. (i) Minimize the following Boolean function:

$$f(A,B,C,D)=\sum m(5,7,8,10,13,15)+\sum d(0,1,2,3).$$

(ii) Draw all the basic gates using NAND and NOR gates. **(6+6.5)**

OR

Q3. (i) Convert the following expression to sum-of-product form.

a. (A+B)(B'+C)(A'+C)

b. (A+C)(AB'+AC)(A'B'+C')

c. (B+C').(A+B')

(ii) State all the laws of boolean algebra and derive an explain about the De'morgans Theorem. **(6+6.5)**

UNIT-II

Q4. A sequential circuit with two D-flip flops A and B, two inputs 'x' and 'y' and one output 'z' is specified by the following next state and output equation.

A(t+1) = x'y+xA, B(t+1) = x'B+xA and Z = B

(i) Draw the logic diagram of the circuit.

(ii) List the state table and draw the corresponding state diagram. **(6+6.5)**

OR

Q5. Design and implement 3-bit ripple counter using J-K flip flop. Draw the state diagram, logic diagram and timing diagram for the same. **(12.5)**

P.T.O.

UNIT-III

Q6. Reduce the number of states in the following state table and tabulate the reduced state table shown below: **(12.5)**

Present state	Next state		Output	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
a	f	b	0	0
b	d	c	0	0
c	f	e	0	0
d	g	a	1	0
e	d	c	0	0
f	f	b	1	1
g	g	h	0	1
h	g	a	1	0

OR

Q7. A clocked sequential circuit with single input x and single output z produces an output z=1 whenever the input x compares the sequence 1011 and overlapping is allowed. Obtain the state diagram, state table and design the circuit with D flip-flops. **(12.5)**

UNIT-IV

Q8. Design a digital system having one 4-bit binary counter 'C' whose internal bits are labeled C_4 C_3 C_2 C_1 with C_4 MSB and C_1 as LSB. It has two flip-flops named 'X' and 'Y'. A start signal incrementing the counter 'C' by 1 on arrival of next clock pulse and continues to increment until the operation stops. Given that the counter bits C_3 and C_4 determines the sequence of operation. The system must satisfy following–

(1) Initiate the operation when start signals = 1 by clearing counter 'C' and flip-flop "Y", i.e., C = 0000 and Y = 0.

(2) If counter bit $C_3 = 0$, it causes E to be cleared to 0 i.e., E = 0 and the operation proceeds.

(3) If counter bit $C_3 = 1$, E is set to 1 i.e., E = 1 and

(a) if C4 = 0, count proceeds.

(b) if C4 = 1, F is set to 1 i.e., F = 1 on next clock pulse and system stops counting. **(12.5)**

OR

Q9. (a) What are the fault models?

(b) What are the different defect categories?

(c) Briefly explain different fault durations.

(d) Write a short note on fault nature. **(3+4+3+2.5)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] FEBRUARY 2023

Paper Code: CIC205 ***Subject: Discrete Mathematics***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Answer all the following questions briefly: **(3x5=15)**

a) Represent the statement using predicate and quantifier and negate it **(3)**
For all the real number x if $x > 5$ then $x^2 > 25$

b) Evaluate the condition of the function to be Surjective? Give Example of it **(3)**

c) Find the Converse and Contrapositive of the Statement "If x is positive then $x \neq 0$" **(3)**

d) Define Euler path and Euler circuit with the help of Example **(3)**

e) Prove that Set of All ineteger Z does not form a Group Under Multiplication with identity element as 1 **(3)**

UNIT–I

Q2 a) Draw the following set operations with the help of Venn diagram **(4)**
i) Union
ii) Intersection
iii) Disjoint
iv) Difference

b) Prove that "if x,y $\in$ Z (set of integer)such that xy is odd then both x and y are odd, by proving its contrapositive **(4)**

c) Show that $((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (p \rightarrow r)$ is tautology By Rules of Preposition **(7)**

Q3 a) Prove the statement " if x is an integer and x^2 is even the x is also even **(4)**

b) Check the validity of the argument. If the races are fixed or the casinos are cooked, then the tourist trade will decrease, if the tourist trade decreases, then the police will be happy. The police force is never happy therefore the races are not fixed. **(4)**

P.T.O.

CIC-205
P 1/2

c) In how many ways can a team of 11 cricketers be chosen from 6 bowlers ,4 wicket keepers and 11 batsmen to give a majority of batsmen if atleast 4 bowlers are to be included and there is one wicket keeper? **(7)**

UNIT–II

Q4 a) Analyse all the three cases of Master method in solving Recurrance Relation **(7)**

b) Minimize the given function using K-map **(8)**
F = ABC'D' + ABC'D + AB'C'D + ABCD + AB'CD + ABCD' + AB'CD'

Q5 a) Let A = { 1,2,3,4,6} and R is a relation on Set A such that aRb if a/b (a divide b) Check wheather Relation R is POSET **(7)**

b) What are the different Solution methods for first order Recurrence Relations with constant coefficient? Explain with example? **(8)**

UNIT-III

Q6 a) Show that if $a^2 = e$ for all a in a group G(A, *) , then G is Commutative **(5)**

b) Explain homomorphism, Isomorphism, and Automorphism with Example **(5)**

c) State and Prove Lagrange's Theorem **(5)**

Q7 a) Analyse the necessary condition for the group to be Abelian? Give one Example **(5)**

b) State Cayley's Theorem **(5)**

c) If for each a and b in group G , if $(ab)^2 = a^2b^2$, show that G is abelian **(5)**

UNIT – IV

Q8 a) Evaluate the total numbers of Colours Required for Proper Colouring of Complete Graph such that No two Adjacent vertex should have same colour.. **(8)**

b) State and Prove the BFS algorithm with Example **(7)**

Q9 Write short notes on the following:

a) Five Colour Theorem **(8)**

b) Minimum Spanning Tree **(7)**

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(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH)] FEBRUARY 2023

Paper Code: ECC-207 ***Subject: Digital Logic And Computer Design***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questions Q.No. 1 which is compulsory. Select one question from each Unit. Internal choice is indicated. Assume missing data, if any.

Q1. Attempt all questions: **(3x5=15)**

(a) Write the base of the following number systems: Decimal, Binary, Octal, and Hexadecimal.
(b) Draw symbol and write the truth table of JK flip flop.
(c) State the necessity of multiplexer.
(d) Write about parallel priority interrupts.
(e) List out the typical characteristic of multiprocessors.

UNIT-I

Q2. (a) State and prove De Morgan's Theorems. **(5)**
(b) Design 1: 16 demultiplexer using 1: 4 demultiplexers. **(10)**

Q3. (a) Draw the circuit diagram of BCD to 7 segment decoder and write its truth table. **(7)**
(b) Simplify the following Boolean function, $f(W,X,Y,Z)=\sum m(2,6,8,9,10,11,14,15)$ UsingQuine-McClukey tabular method. **(8)**

UNIT-II

Q4. (a) Describe the working of Master-Slave JK Flip-Flop with Truth Table and Logic diagram. **(7)**
(b) Describe the operation of 4 bit SISO shift register with the help of block diagram, truth table and timing diagram. **(8)**

Q5. (a) Draw the block diagram of Programmable Logic Array. **(7)**
(b) Define modulus of a counter? Write down the number of flip flops required for mod-5 counter? **(8)**

UNIT-III

Q6. (a) Explain the organizations of micro programmed control unit with neat sketch. **(8)**
(b) What are the different phases of a basic computer instruction cycle? Explain instruction cycle with flowchart. **(7)**

Q7. (a) Explain with a neat diagram, system configuration incorporating an I/O processor. **(8)**
(b) Discuss the following: Computer configuration for micro program, Symbolic micro program and binary micro program. **(7)**

P.T.O.

UNIT-IV

Q8. (a) Show internal configuration of a DMA controller diagrammatically and explain how it's working. **(8)**

(b) Explain Types of Interrupts with an example for each. **(7)**

Q9. (a) Explain how memory management unit provides memory protection. **(7)**

(b) Explain Cache with Set-Associative and direct mapping. Assume your own example address and explain. **(8)**

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(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] FEBRUARY 2023

Paper Code: EEC-209 ***Subject: Electrical Materials***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit.

Q1 Attempt **all** questions:-

(a) What is "forbidden energy gap" in energy band diagram? **(1)**

(b) What is meant by 'Impregnation' of insulating materials? **(1)**

(c) Define "Curie Temperature". **(1)**

(d) What is a 'fuse'? State two properties of materials used for making fuse. **(3)**

(e) What is a 'bimetal'? What is its use? **(2)**

(f) Explain 'Magnetostriction'. **(1)**

(g) Define 'Thermoplastics'? State one example of 'Thermoplastics'. **(2)**

(h) Name two high resistance conducting materials and two low resistance conducting materials. **(4)**

UNIT-I

Q2 (a) Determine the critical current that can flow through a long thin superconducting conductor of diameter 1 mm. The value of critical magnetic field for the conductor material is 80000 A/m. **(5)**

(b) State and explain the factors affecting electrical resistivity. **(10)**

Q3 (a) A certain load is to be carried by an overhead line. For the same power loss in the line, compare the diameter, weight and cost of aluminium conductor with that of copper, assuming aluminium to have a specific resistance of 2.85 μΩcm, specific gravity 2.71 and cost Rs 15000 per tonne. The corresponding figures for copper may be taken as 1.7, 8.89 and Rs 30000 per tonne respectively. **(9)**

(b) Determine the temperature coefficient of resistance of material used in a resistor, if the resistance at 250 ^{0}C is 50 ohm and at 700 ^{0}C is 57.2 ohm? **(6)**

UNIT-II

Q4 (a) Write a short note on liquid insulating materials and gaseous insulating materials. **(9)**

(b) Define 'varnishes', 'glazing agents' and 'resins'. **(6)**

Q5 (a) Classify insulating materials on the basis of temperature. **(7)**

(b) The conductor of a single core cable has a diameter of 6 mm, the diameter of the insulation included is 24 mm. If the insulation resistance of the cable is 16000 Ω/ km, calculate the specific resistance of the dielectric used. **(8)**

UNIT-III

Q6 (a) Differentiate between "Soft magnetic materials" and "Hard magnetic materials" and state an example of each. **(10)**

(b) The eddy current loss in a magnetic material subjected to maximum flux density of 1.2 Wb/m^2 alternating sinusoidally at a frequency of 50 Hz is 1600 W. Determine the eddy current loss when the maximum flux density is 1.5 Wb/m^2 and the frequency is 60 Hz. **(5)**

P.T.O.

(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] FEBRUARY 2023

Paper Code: CIC209 **Subject: Data Structures**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

Q1 Attempt all questions: **(2.5x6=15)**

a) What is DEQUE? How it is different from priority queue.

b) What are polish notations in stack? Explain all polish notations with example.

c) Which sorting technique is best and under what conditions? Justify your answer with the help of example.

d) What is header linked list. Explain its types.

e) How two-dimensional array are internally stored? What is row major and column major matrices?

f) What is stack? Explain operations on stack. How stack is different from queue?

UNIT-I

Q2 a) Define data structure. In how many ways can you categorize data structure? Explain primitive and non-primitive data structures. Discuss operations performed on data structures. **(5)**

b) What is double linked list? Write a function to insert a node at specified location into doubly linked list. **(5)**

c) Write an algorithm to convert infix expression to postfix expression. Convert the following infix expression into postfix expression. **(5)**

A + (B * C – (D / E ^ F) * G) * H

Q3 a) What is linear linked list? Write algorithm to insert a node at the beginning of singly linked list. **(5)**

b) Write algorithm for insertion in circular queue. Explain why circular queue is better than linear queue. **(5)**

c) Write an algorithm to evaluate the postfix expression. Evaluate the following postfix expressions using stack. **(5)**

5 9 8 + 4 6 * + 7 – *

UNIT-II

Q4 a) What is m-way tree? Construct 3-way tree out of empty search tree with following keys in order **(5)**

D, K, P, V, A, G

b) What is B^+ tree? How B^+ tree is different from B-tree. Explain with example. **(5)**

P.T.O.

CIC209
P1/3

c) What is AVL tree? Explain insertion and deletion rotations. Construct AVL tree from following elements. **(5)**

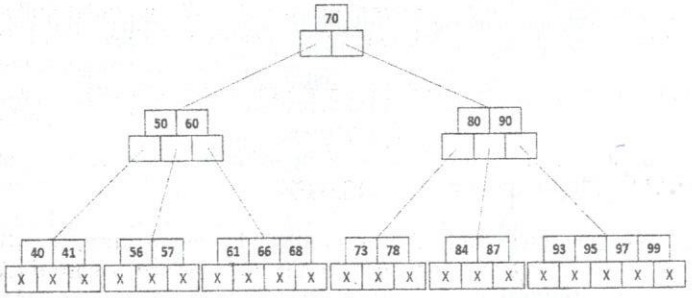
64, 1, 14, 26, 13, 110, 98, 85

Q5 a) What is sparse matrix? Explain different types of sparse matrix with suitable examples. State different storage formats of sparse matrix. **(5)**

b) The pre-order and in-order traversal of a tree are given below. Construct corresponding binary tree. Write its equivalent post order traversal. **(5)**

Preorder: F A E K C D H G B
Inorder: E A C K F H D B G

c) What is b-tree? What are properties of b-tree? Explain balancing rules of b-tree. Delete elements 66, 90, 87, 56 from the following b-tree of order 5 **(5)**



UNIT-III

Q6 a) Write algorithm for insertion sort. Perform insertion sort on following values **(8)**

77, 33, 44, 11, 88, 22, 66, 55

b) What is binary search? Write algorithm for binary search. Search item 23 from the following sorted data elements using binary search **(7)**

2, 5, 8, 12, 16, 23, 38, 56, 72, 91

Q7 a) Define hashing. Why do we use hashing? Discuss any two hashing methods with example. How hashing is different from other searching techniques? **(7)**

b) Write algorithm for merge sort. Perform merge sort on following values. **(8)**

38, 27, 43, 3, 9, 82, 10

UNIT-IV

Q8 a) What is graph traversal? Differentiate BFS and DFS with example. Write their traversal algorithms for graph. **(7)**

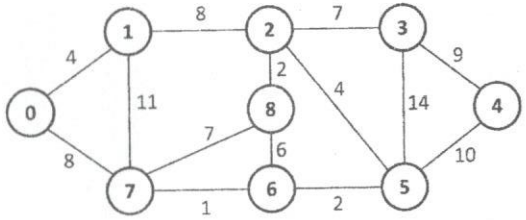
P.T.O.

CIC-209
P2/3

b) Explain minimum spanning tree. What is difference between Prim's and Kruskal's algorithms. **(8)**

Q9 a) What are different ways of representing a graph? Explain different shortest path algorithms with examples. **(8)**

b) Find minimum spanning tree for the following graph using Kruskal's algorithm. **(7)**



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CEC-209
P3/3

(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] FEBRUARY 2023

Paper Code: EEC-211 ***Subject: Electrical Machines-I***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Assume any data, if missing.

Q1 (a) What are the advantages of analysing energy conversion devices by field energy concept?
(b) Why the armature core of a DC machine is laminated, while the pole core is not?
(c) Derive the EMF equation of a DC machine.
(d) A DC motor is running at 1000 rpm at rated load. What will happen, if- (i) The supply terminals are reversed (ii) The field winding is disconnected?
(e) Why the main flux in a transformer remains practically constant from no-load to full-load?
(f) State with reason which type of connections is preferred in a 3-phase distribution transformer? **[2.5x6=15]**

UNIT-I

Q2 (a) What is the principle of electromechanical energy conversion? What is the energy balance equation? Write it in its differential form and name the energies involved. **[7]**
(b) Explain the singly excited and doubly excited magnetic systems with examples. Also derive the expressions for energy stored in a singly excited magnetic system in terms of reluctance. **[4+4]**

Q3 (a) Explain and illustrate with suitable diagram (i) lap winding (ii) wave winding of the armature of a DC machine. Also state the difference in two. **[7]**
(b) A 6-pole DC generator has an armature with 90 slots and 8 conductors per slot and runs at 1000 rpm. The flux per pole is 0.05 Wb. Determine the induced EMF, if the winding is (i) lap connected (ii) wave connected. **[8]**

UNIT-II

Q4 Neatly draw and explain how internal and external characteristics of a DC series generator are plotted and explain when and why a DC series generator starts to work as a constant current source. **[15]**

Q5 (a) With neat diagram explain how speed of a DC shunt motor is controlled by Ward-Leonard method. State its advantages and disadvantages also. **[7]**
(b) A 120 V DC shunt motor has an armature resistance of 0.2 Ω and a field resistance of 60 Ω. The full load line current is 60 A and full load speed is 1800 rpm. If the brush contact drop is 3 V, find the speed of the motor at half load. **[8]**

UNIT-III

Q6 (a) State the principle of operation of a transformer; and derive its EMF equation. **[6]**
(b) Explain with neat diagrams how the open circuit and short circuit tests are performed on a single phase transformer. Also explain how the equivalent circuit parameters and voltage regulation of the transformer are determined from these tests. **[9]**

Q7 (a) Derive the condition for maximum efficiency and the expressions for the output kVA corresponding to maximum efficiency of the transformer. **[7]**
(b) In a 50 kVA, 11 kV/400 V transformer, the iron and copper losses are 500 W and 600 W respectively under the rated conditions. Calculate the efficiency on unity power factor at full load. Find the load for maximum efficiency and the iron and copper losses corresponding to this load. **[8]**

UNIT-IV

Q8 What are the advantages of parallel operation of transformers? State the conditions for satisfactory parallel operation of three-phase transformers. Also derive the expressions for the division of load between two transformers in parallel. **[3+5+7]**

Q9 Write short notes on the following:
(a) Auto transformer **[7]**
(b) Instrument Transformers **[8]**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] FEBRUARY 2023

Paper Code: ECC213 ***Subject: Electromagnetic Field Theory***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Attempt **all** questions:

a) Give Physical significance of Divergence theorem and Stoke's theorem. **(2)**

b) Write conversion matrix for cylindrical to Cartesian co-ordinate system. **(2)**

c) Show that a transmission line will be distortion less if RC=LG. **(2)**

d) Define depth of penetration. **(2)**

e) Drive Maxwell's third and fourth equation by basic equations. **(2)**

f) Define relaxation time. **(2)**

g) State on what factors the input impedance of a transmission line depends? **(2)**

h) What are the values of E & H components if the EM wave is propagating along the x-axis? **(1)**

UNIT-I

Q2 a) A field $D=r^2\cos^2\varphi 1_r+z \sin\varphi 1_\varphi$ exists in the region$0\leq z \leq 1$ *and* $r = 4$. Verify the divergence theorem for the configuration. **(7.5)**

b) Drive an expression for (i) spherical arrangement of capacitor (ii) Co-axial cylindrical arrangement. **(7.5)**

OR

Q3 a) Verify Stoke's theorem for $f=(2x-y)1_x-yz^2 1_y-y^2z1_z$ where s is the upper half surface of the $x^2+y^2+z^2=1$ and c is boundary **(8)**

b) Describe curl, divergence, and gradient. **(7)**

UNIT-II

Q4 a) Determine the total charge (a) on line charge $0<x<5$ mt if $\rho_L=12x^2$mC/m. (b) on the cylinder $\rho=3, 0<z<4$ if $\rho_s= \rho z^2$nC/m^2 (c) with the sphere r=4mt if$\rho_v= \left[\frac{10}{r\sin\theta}\right]$ C/m^3. **(7.5)**

b) Drive the boundary conditions at the interface of two magnetic mediums with no current at the boundary. **(7.5)**

OR

Q5 a) Explain (i) Faraday's law (ii) Ampere's Circuital Law. **(7.5)**

b) Using Gauss's law in integral form, obtain electrical field in all regions due to following charge distribution in free space;

$P(r,\varphi,z)=0 \quad 0<r\leq a$

$= \rho_0 \quad a\leq r\leq b$

$=0 \quad b\leq r\leq \infty$ **(7.5)**

UNIT-III

Q6 a) An E field in free space is given as $E=800\cos(108t-\beta y)1_z$V/m Find (i)$\beta$ (ii) λ (iii) H at P (0.1,1.5,0.4) at t=8ns. **(7.5)**

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b) Drive general expression for reflection coefficient and transmission coefficient for E and H fields when an electromagnetic wave is incident normally on the boundary separating two different(i) conducting media (ii) perfectly dielectric media. **(7.5)**

OR

Q7 a) Drive the wave propagation equation in dielectric medium. Find out the propagation constant, attenuation constant and phase shift constant also. **(7.5)**

b) A Steel pipe is constructed of a material for which we may assume μ_r=200 and σ=5X10^6 mho/m. The outer and inner radii are 8 and 6mm, respectively and the length is 80m. If the total current carried by the pipe is 2cos10$^4\pi t$ A, find (i) the skin depth (ii) the effective resistance (iii)the DC resistance (iv)time average power loss. **(7.5)**

UNIT-IV

Q8 a) Why it is desirable to achieve an impedance match in a transmission line? Explain different methods of impedance matching. **(7.5)**

b) Define standing wave ratio, how it is related to voltage and current reflection coefficient? **(7.5)**

OR

Q9 a) A 30m long transmission line of impedance 50Ω is operating at 2MHz. The line is terminated with a load of Z_L= 60+j40 Ω. The velocity of propagation of the line is 1.8X10^{8}m/s. Find the reflection coefficient, standing wave ratio and input impedance of line. **(7.5)**

b) An air line has characteristic impedance of 75 Ω and phase constant of 3 rad/m at 100MHz. Calculate the capacitance and inductance of the line, per meter. **(7.5)**

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