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

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018

Paper Code: ETCS-203	Subject: Foundation of Computer Sciences
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 Explain following in brief:- **(2.5x10=25)**

(a) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.

(b) Show that $\exists y \forall x P(x,y) \Rightarrow \forall x \exists y P(x,y)$

(c) Define groups, subgroups and normal subgroups with suitable example.

(d) Draw the Hasse diagram for the partial ordering $\{(A,B)|A \leq B\}$ on the power set P(S) where $S = \{a,b,c\}$.

(e) Define a Chain. Give an example of an infinite set which is a Chain?

(f) A set $A = \{1,2,3,4,5,6,7\}$, Find the $(2\,4\,6\,7) o (1\,3\,5)$. That composition is even permutation or odd permutation?

(g) A connected plane graph has 10 vertices each of degree 3. Into how many region, does a representation of this planner graph split the plane?

(h) Find the minimum number of students in a class to be sure that four out of them are born in the same month.

(i) If H is a subgraph of G such that $x^2 \in H$ for every $x \in G$, then prove that H is a normal subgroup of G.

(j) Determine whether the poset $(\{1,2,3,4,5\},/)$ a lattice.

UNIT-I

Q2 (a) Prove that if $n = ab$ where a and b are positive integer, then $a \leq \sqrt{n}$ or $b \leq \sqrt{n}$. **(4)**

(b) Find the CNF of the function $f = [p \wedge (\neg q \wedge r)] \vee \neg r$ and then find its DNF from it. **(5)**

(c) Write an equivalent expression for $(p \Rightarrow q \wedge r) \vee (r \Leftrightarrow s)$ which contains neither the bi-conditional nor the conditional. **(3.5)**

Q3 (a) Give an example to illustrate proofs by contraposition and contradiction methods. **(6)**

(b) Prove that $n(n+1)(2n+1)$ is divisible by $6 \forall n \in N$ using mathematical induction. **(4)**

(c) Write the symbolic form of the proposition: "This is a criminal who has committed every crime". Also derive its negation. **(2.5)**

UNIT-II

Q4 (a) If $A = \{4,5,7,8,10\}$, $B = \{4,5,9\}$, $C = \{1,4,6,9\}$, then verify that $(A \cap B) \cup (A \cap C)$ **(4)**

(b) Let $A = \{4,6,8,12,24,36,48,72\}$ with the partial order of divisibility. Draw its Hasse diagram. **(5)**

(c) Prove that s lattice $(L, \leq)$ is modular if and only if $(a \wedge b) \vee (a \vee c) = a \wedge (b \vee (a \wedge c))$ for all $a, b, c \in L$. **(3.5)**

P.T.O.

ETCS-203
P1/2

Q5 (a) Explain the pigeonhole principle with suitable examples. **(6)**

(b) Using Binomial theorem prove that: **(6.5)**

$$3^n = \sum_{r=0}^{n} C = (n;r)2^r$$

UNIT-III

Q6 (a) Solve the following recurrence relation. $t_n - 7t_{n-1} + 10t_{n-2} = 5.2^n$, with initial conditions $t_0 = 5, t_1 = 16$. **(6.5)**

(b) Explain Hamiltonian Circuit with suitable examples. **(6)**

Q7 (a) State and prove 5 color theorem. **(6)**

(b) Suppose that a connected planar simple graph has 20 vertices, each of degree 3. Into how many regions does a representation of this planar graph split the plane? **(3)**

(c) Illustrate the trade-off between adjacency lists and adjacency matrices. **(3.5)**

UNIT-IV

Q8 (a) Define a cyclic group, show that the set $\{1, \omega, \omega^2\}$ is a cyclic group of order 3 with generators ω and ω^2 with respect to multiplication, ω being the cube root of unity. **(6)**

(b) In the ring $(S, +, .)$, S is asset of 2 x 2 matrices of the form $\begin{bmatrix} a & b \\ 0 & c \end{bmatrix}$ where a, b, c are even integers and + and. are respectively matrix addition and multiplication. Show that $(S, +, .)$, is non commutative ring with no unity element. **(6.5)**

Q9 Write short note on:-

(a) Cayles's Theorem with suitable examples. **(4)**

(b) Homomorphism, isomorphism and automorphism with examples. **(4.5)**

(c) Minimization of Boolean function. **(4)**

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ETCS-203
P2/2

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

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] NOVEMBER-DECEMBER- 2018

Paper Code: ETCS-209	Subject: Data Structure
Time: 3 Hours	Maximum Marks: 75

Note: Attempt any five questions including Q.No1 which is compulsory. Select one question from each unit.

Q1 Attempt all:- **(2.5x10=25)**

(a) What is bucket Hashing?
(b) What is the condition to check overflow and underflow condition in circular queue?
(c) What is Header Linked list?
(d) What is the maximum possible Number of nodes in binary tree at level 7.
(e) Define In-degree and Out-degree of a node in the graph.
(f) Explain Doubly ended Queue.
(g) For 1-D array if base address is 2000, find 6^{th} index element address if a data stored in this array needs only 3 byte.
(h) Explain application of DFS.
(i) Explain threaded Binary tree
(j) What is M-way Tree?

UNIT-I

Q2 (a) A 2-dimensional array X[5] [4] is stored row-wise in the memory. The 1^{st} element of the array is stored at location 80. Find the memory location of X[3] [2] if each element of array required 4 byte memory space. **(6)**

(b) Consider the following infix expression:- **(6.5)**
A+(B*C-(D/E↑F)*G)*H
Transform this expression into postfix expression using stack.

Q3 (a) Write an algorithm/Program to implement Queue using linked list. **(6)**

(b) What is circular linked list? What are its advantages over linear linked list? Write algorithm to insert a node at desired position in circular linked list. **(6.5)**

UNIT-II

Q4 (a) Construct expression tree for the following expression: **(6)**
A+(B-C)*D+(E*F)

(b) Create AVL search tree from given set of values and explain rotations:-
H I J B A E C F D G K L **(6.5)**

Q5 (a) Explain following: (Give one example of each) **(2x3=6)**
(i) BST
(ii) Complete Binary tree
(iii) Heap Tree

(b) Draw Binary tree when Inorder and Preorder traversal is given as follows and Write algorithm for the same. **(6.5)**
Pre: ABCDEFGHIJKI
In: BADCFEJHKGI

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P1/2

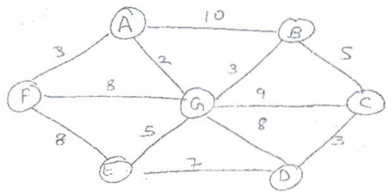
UNIT-III

Q6 (a) Draw directed graph that corresponds to following adjacency matrix. Also write down adjacency list corresponding to graph. **(6)**

	V0	V1	V2	V3
V0	0	1	1	0
V1	0	0	1	1
V2	0	0	0	1
V3	1	0	0	0

(b) Write BFS and DFS traversal algorithm for a graph. **(6.5)**

Q7 (a) Explain minimum spanning tree. Find minimum spanning tree for the following graph using kruskal's algo. **(6)**



(b) Create B-tree of order 5 taking the keys in give order into an initially empty tree 65, 71,70, 66, 75, 68, 72, 77, 74, 69, 83 ,73, 82, 88, 67, 76, 78, 84,85,80 then delete 75,69,73,88,67. **(6.5)**

UNIT-IV

Q8 (a) What is Hashing? Explain various hashing algorithm. Discuss various collision resolution techniques. **(6)**

(b) Write a algorithm for Quick Sort and perform the same sorting on following values: **(6.5)**
75,12,23,58,11,94,6,8,13.

Q9 (a) Write algorithm/Program for binary search. Explain why binary search is better than linear search. **(6)**

(b) What is difference between internal and external sorting? Write any one algorithm for internal sorting and one for external sorting. **(6.5)**

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ETCS-209
P2/2

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END TERM EXAMINATION

THIRD SEMESTER [B. TECH.] NOVEMBER-DECEMBER 2018

Paper Code: ETCS-211	***Subject: Computer Graphics and Multimedia***

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

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

Q1 Write short notes on the following:- **(10x2.5=25)**

(a) What are the differences between Raster and Random Scan Displays?

(b) Define aspect ratio and resolution with respect to computer graphics.

(c) A raster system with a resolution of 600*400 is given. What is the size of the raster needed to store 4 bits per pixel in bytes? How much storage is required if 8 bit per pixel are to be solved?

(d) Explain Homogeneous Co-ordinate system?

(e) How you define the plotting pixel of a circle using 8-way symmetry?

(f) What do you mean by visible surface detection?

(g) What is specular reflection?

(h) Define Quantization.

(i) What are the steps involved in image preparation used in JPEG image compression.

(j) Write short note on multimedia architecture.

UNIT-I

Q2 (a) Use the Cohen-Sutherland algorithm to clip the line p_1p_2 with p_1 (70, 30) $-p_2$ (100, 20) against a window a (50, 10), c (80, 40). **(6.5)**

(b) Convert a line from (11, 13) to (21, 18) using Bresenham's line algorithm. **(6)**

Q3 What do you mean by projection: Discuss different types of projections? **(12.5)**

UNIT-II

Q4 Distinguish between Huffman codes and LZW coding methods of text compression. Explain with example. **(12.5)**

Q5 What are the components of multimedia system? In what formats are these data are stored in a computer. **(12.5)**

UNIT-III

Q6 Derive the Bezier curve. Write the properties of Bezier Curve. **(12.5)**

Q7 Explain the flat shading, Gouraud shading and Phong shading. **(12.5)**

UNIT-IV

Q8 (a) What are the different types of authoring tools in multimedia? Discuss each in brief. **(6)**

(b) Derive expressions for 2-D rotation, Scaling and sheering. **(6.5)**

Q9 What is the difference between an image space and object space hidden surface algorithm? Explain in detail. **(12.5)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018

Paper Code: ETMA 201	***Subject: Applied Mathematics-III***
[BATCH 2013 ONWARDS]	

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. a) Find the Fourier sine and cosine transform of xe^{-ax}. **(5)**

b) Interpolate by means of Gauss' backward formula, the population of a town for the year 1974, given that. **(5)**

Year	1939	1949	1959	1969	1979	1989
Population (in thousands)	12	15	20	27	39	52

c) Using Picards' process of successive approximations, obtain a solution upto the fifth approximations of the equation $\frac{dy}{dx} = y + x$, such that y= 1 when x=0. **(5)**

d) State and prove linearity property of Fourier transform. **(5)**

e) Determine Z transform $Z\{f_n\}$, where $f_n = e^{-3n}$. **(5)**

Unit-I

Q2. a) Find the Fourier series expansion of the following periodic function of period 4.

$$f(x) = \begin{cases} 2 + x, & -2 \le x \le 0, \\ 2 - x, & 0 < x \le 2, \end{cases} \quad f(x+4) = f(x).$$ **(6.5)**

b) Express the function $f(x) = \begin{cases} 1 & for\ |x| \le 1, \\ 0 & for\ |x| > 1, \end{cases}$ as a Fourier integral. Hence evaluate $\int_0^\infty \frac{\sin \mu \, \cos \mu x}{\mu} d\mu$. **(6)**

Q3. a) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, x > 0, t > 0$, subject to the conditions. **(6.5)**

i) u=0, when x= 0, t > 0 ii) $u = \begin{cases} 1, & 0 < x < 1 \\ 0, & x \ge 1, \end{cases}$ when t = 0 and

iii) u(x, t) is bounded.

b) Find the Fourier cosine series of the function $f(x) = \begin{cases} x, & 0 \le x \le 2 \\ 4, & 2 \le x \le 4 \end{cases}$. **(6)**

Unit-II

Q4. a) Find the inverse Z transform of F(z), where F(z) is given by $\frac{7z - 11z^2}{(z-1)(z-2)(z+3)}$. **(6.5)**

b) Using convolution theorem, find $Z^{-1}\left[\frac{z^2}{(z-1)(z-3)}\right]$. **(6)**

P.T.O.

ETMA-201

P.1/2

Q5. a) Let $Z\{f_n\} = F(z) = \frac{[3z^2 - 4z + 7]}{(z-1)^3}$. Find f_0, f_1, f_2 and f_3. **(6)**

b) Solve the difference equation $y_{n+3}-6y_{n+2}-8y_n=1, y_0=0,\ y_1=1,\ y_2=2$ using Z transforms. **(6.5)**

Unit-III

Q6. a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct to three decimal places. **(6)**

b) Solve the equation: 20x+y-2z =17; 3x +20y – z= -18; 2x -3y +20z =25 by Gauss Seidal iteration method. **(6.5)**

Q7. a) Using Newton-Raphson method, find a root of the equation $x \sin x + \cos x = 0$ which is near x =π correct to three decimal places. **(6.5)**

b) The following table gives the values of x and y;: **(6)**

X	1.2	2.1	2.8	4.1	4.9	6.2
Y	4.2	6.8	9.8	13.4	15.5	19.6

Find the value of x corresponding to y=12, using Lagrange's interpolation formula.

Unit-IV

Q8. a) From the table below, for what value of x, y is minimum? Also find this value of y. **(6)**

X	3	4	5	6	7	8
Y	0.205	0.240	0.259	0.262	0.250	0.224

b) Evaluate $\int_0^1 \frac{dx}{1+x}$ talking 7 ordinates by applying Simpson's 3/8th rule. Hence deduce the value of $\log_e 2$. **(6.5)**

Q9. a) Solve the following by Euler's modified method: **(6)**

$\frac{dy}{dx} = \log(x+y), y(0) = 2$ at x=1.2 and 1.4 with h =0.2.

b) Apply Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0)= 1 at x =0.2, 0.4. **(6.5)**

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ETMA-201
P2/2

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2017

Paper Code: ETCS-203 [Batch 2013 onward]	Subject: Foundation of Computer Science

Time: 3 Hours | Maximum Marks: 75

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

Q1 (a) What do you mean by Quantifiers? Explain nested quantifiers.
(b) Show that logical expression $\neg(p \to q) \to p$ is a tautology.
(c) Prove by contradiction that "If n is an integer and 3n+2 is odd, then n is odd."
(d) Let f and g be the functions from the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. What is the composition of fog and gof?
(e) Use mathematical induction to prove the inequality $\mathbf{n<2^n}$.
(f) How many bit strings of length four do not have two consecutive 1s?
(g) What is the solution of the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with $a_0 = 2$ and $a_1 = 7$.
(h) Explain the Pascal's Identify and Triangle.
(i) Give the formula for the number of elements in the union of 4 sets A_1, A_2, A_3 & A_4.
(j) Find the value of the Boolean Function represented by $F(x,y,z) = xy + \bar{z}$. **(2.5x10=25)**

Unit-I

Q2 (a) Explain the pigeonhole principle. How many students must be in a class to guarantee that at least two students receive the same score on the final exam, if the exam is graded on a scale from 0 to 100 points? **(4.5)**
(b) Find the solution to the recurrence relation- **(8)**
(i) $a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$
(ii) $a_n = 5a_{n-1} - 6a_{n-2} + 7^n$.

Q3 (a) Let R be the relation on the set A = {0, 1, 2, 3} containing the ordered pairs (0, 1), (1, 1), (1, 2), (2, 0), (2, 2) and (3, 0). Find (i) Reflexive closure of R (ii) Symmetric closure of R. **(4.5)**
(b) Let R be the relation on the set of real numbers such that aRb if and only if a-b an integer. Is R an equivalence relation? **(4)**
(c) Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalences. **(4)**

Unit-II

Q4 (a) Explain principle of Inclusion-Exclusion. Find how many positive integers not exceeding 1000 are divisible by 7 or 11. **(4.5)**
(b) Obtain: **(8)**
(i) PDNF form of $[(p \wedge q) \vee (\neg p \wedge r) \vee (p \wedge r)]$.
(ii) PCNF form of $[(p \vee q) \wedge (\neg p \to \neg q)]$.

P.T.O.

ETCS-203
P.1/2

Q5 (a) Show that the hypothesis "It is not sunny this afternoon and it is colder than yesterday." 'We will go swimming only if it is sunny", "if we do not go swimming, then we will take a canoe trip", and "If we take a canoe trip then we will be home by sunset" lead to the conclusion "we will be home by sunset." **(5.5)**

(b) Let $A = \{x \mid 3x^2 - 7x - 6 = 0\}$ and $B = x|6x^2 - 5x - 6 = 0\}$, then find $A \cap B$. **(3)**

(c) Prove that $\sqrt{2}$ is irrational by giving proof by Contradiction. **(4)**

Unit-III

Q6 (a) Is the poset (Z^+, |) a lattice. **(4)**

(b) Draw the Hasse diagram representing the partial ordering {(a, b) | a divides b} on {1, 2, 3, 4, 6, 8, 12}. Also find the minimal and maximal elements of the Hasse diagram. **(4.5)**

(c) What is distributive lattice? Show that in any distributive lattice, the set of all complemented elements is a sublattice. **(4)**

Q7 (a) Use the K-maps and simplify: **(3x2=6)**

(i) $XY + \overline{X}\,Y$

(ii) $X\,\overline{Y} + \overline{X}\,Y$

(iii) $X\,\overline{Y} + \overline{X}\,Y + \overline{X}\,\overline{Y}$

(b) Explain Cayley's theorem by using an example. **(3)**

(c) Explain homomorphism, isomorphism and automorphism? **(3.5)**

Unit-IV

Q8 (a) Give the proof of Euler's formula. Suppose that a connected planar simple graph has 20 vertices, each of degree 3. Into how many regions does a representation of this planar graph split the plane. **(4.5)**

(b) Show that if $a^2 = e$ for all a in a group G (A, *), then G is commutative. **(4)**

(c) Explain the 5 color theorem with suitable example. **(4)**

Q9 Write short notes on:

(a) Lagrange's theorem **(4)**

(b) Normal Subgroups and Ring **(4)**

(c) Euler and Hamiltonian paths **(4.5)**

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ETCS-203
P2/2

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

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER 2017

Paper Code: ETCS-209	Subject: Data Structure
Time: 3 Hours	Maximum Marks: 75

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

Q1 (a) What is an Abstract Data Type (ADT)? **(10x2.5=25)**
(b) What is a self-referential structure?
(c) Write at least two differences in between a singly linked list and doubly linked list.
(d) Define expression tree and its usage.
(e) When a sorting procedure is considered to be stable?
(f) Differentiate inbetween B Tree and B+ tree.
(g) Show that the inorder traversal of a BST always produces the sorted output.
(h) A B-tree of order 4 is built from scratch by 10 successive insertions. What is the maximum number of node splitting operations that may take place?
(i) What is the heap property? Illustrate the insertion of an element in a heap through an example.
(j) Define perfect binary tree. How many different binary trees are possible with four nodes?

Unit-I

Q2 List major differences in between a stack and queue. Write an algorithm to add a node at the end of a circular linked list. **(12.5)**

Q3 How to convert infix into a postfix expression. Write a program to carry out this conversion and illustrate the conversion of **A B * C – D + E/F** into a postfix expression. **(12.5)**

Unit-II

Q4 Define an AVL tree. What are the different AVL tree rotations? Construct an AVL tree for the following list of numbers:

10 5 8 12 18 22 1 4 6 30 **(12.5)**

Q5 Define inorder and postorder traversals of a tree using suitable example. Construct a Binary tree using the following data:
INORDER: - BGDKHAEICJF
POSTORDER: - GKHDBEIJFCA **(12.5)**

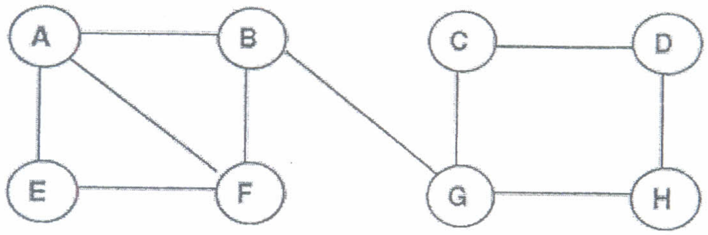
Unit-III

Q6 Define B tree structure properties. Consider a B+ tree in which the maximum number of keys in a node is 7. What is the minimum number of keys in any non-root node? Explain insertion and deletions process in a B tree. **(12.5)**

P.T.O.

ETCS-209
P.1/2

Q7 How to represent a graph using adjacency linked list? Execute the Breadth First Search (BFS) algorithm on the following graph starting from the vertex "A". **(12.5)**



Unit-IV

Q8 Why quicksort is generally considered to be better than mergesort? Explain Pseuodocode of quicksort and mergesort procedures and compare their performances. **(12.5)**

Q9 Define separate chaining, linear probing and quadratic probing. Given the values {2341, 4234, 2839, 430, 22, 397, 3920}, a hash table of size 7, and hash function h(x) = x mod 7, show the resulting tables after inserting the values in the given order with each of these collision strategy. **(12.5)**

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ETCS-209
P2/2

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

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] NOVEMBER-DECEMBER 2017

Paper Code: ETCS-211	*Subject: Computer Graphics and Multimedia*

Time: 3 Hours *Maximum Marks: 75*

Note: *Attempt any five questions including Q.No1 which is compulsory. Select one question from each unit.*

Q1 Write short notes on the following:- **(10x2.5=25)**

(a) Differentiate between Beam Penetration method and Shadow Mask Method.
(b) Explain DDA Line Drawing algorithm.
(c) Translate a square ABCD with the co-ordinates A(0,0), B(5,0), C(5,5), D(0,5) by 2 units in x-direction and 3 units in y-direction.
(d) Define Transformation and write down the various matrices of transformation in 2D.
(e) Define synchronization in multimedia system.
(f) Differentiate between Parallel and Perspective Projection.
(g) Explain window to viewport transformation.
(h) What is hidden surface removal? Explain it with Back-Face removal algorithm.
(i) Define Multimedia and the its various elements.
(j) What do you mean by Data Compression? Also differentiate between Lossless and Lossy compression.

Unit-I

Q2 Describe Bresenham's line drawing algorithm for lines with slope m<1. Use the algorithm to scan a line with end point at (10,12) to 20,18). **(12.5)**

Q3 (a) Derive the expression for rotation of a point about an arbitrary point. **(6.5)**
(b) Perform a 45^0 rotation of triangle A(0,0), B(1,1) and C(5,2). **(6)**
i. about the origin
ii. about the point P(-1,-1)

Unit-II

Q4 Explain the Cohen-Sutherland line clipping algorithm. Using this algorithm to clip a line P_1(70,20) & P_2(100,10) against a window whose lower left corner is (50,10) and upper right hand corner is (80,40). **(12.5)**

Q5 What do you mean by curve design? Explain the Bezier curve and B-spline curve in detail. (12.5)

Unit-III

Q6 Explain the flat shading, gourard shading and phong shading models. Which one is the best among these? Justify your answer. **(12.5)**

Q7 (a) Define MIDI. Explain the various components and devices of MIDI. **(6)**
(b) Explain the different types of authoring tools with their features. **(6.5)**

Unit-IV

Q8 Describe Huffman coding and Lempel-Ziv Encoding data compression techniques in detail. **(12.5)**

Q9 (a) Explain reference model for multimedia synchronization in detail. **(6.5)**
(b) Write a short note on:- JPEG, MPEG. **(6)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2017

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

Time: 3 Hours Maximum Marks: 75

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Use of scientific calculator is allowed.

Q1 (a) Whether the function $f(x) = \sin\left(\frac{1}{x}\right)$ satisfy the Dirichlet's conditions or not? If not mention which condition is not satisfy. **(4)**

(b) Using Fourier integral prove that $\int_0^\infty \frac{\lambda \sin(\lambda x)}{\lambda^2+m^2} d\lambda = \frac{\pi}{2} e^{-mx},\ m > 0, x > 0$. **(4)**

(c) Find order of the difference equation $\Delta^2 y_{n+1} + 3\Delta y_n + 4y_n = 2$. **(4)**

(d) If $Z\{U_n\} = U(z)$, then prove that $Z\left(\frac{U_n}{n}\right) = -\int_z^\infty \frac{U(z)}{z} dz$. **(4)**

(e) Evaluate $\sqrt{12}$ to three places of decimals by Newton-Raphson method. **(4)**

(f) State fundamental theorem for finite differences and using this evaluate
$\Delta^{10}[(1-x)(1-2x^2)(1-3x^3)(1-4x^4)]$. **(5)**

Unit-I

Q2 (a) Find the Fourier series expansion of the function $f(x) = 2x - x^2$, $0 < x < 3$. Also sketch the graph of the function. **(6.5)**

(b) Find half-range cosine series for the function $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$. **(6)**

Q3 (a) Find Fourier transform of e^{-x^2}. **(6)**

(b) Using Fourier transform, solve the heat equation $\frac{\partial\theta}{\partial t} = c^2 \frac{\partial^2\theta}{\partial x^2}, t > 0$ subject to the condition $\theta(x,0) = \begin{cases} \theta_0, & |x| < a \\ 0, & |x| > a \end{cases}$. Find the temperature $\theta(x,t)$. **(6.5)**

Unit-II

Q4 (a) Form the difference equation corresponding to the family of curves
$y = ax + bx^2$. **(6)**

(b) Solve the difference equation $y_{n+2} - 4y_{n+1} + 4y_n = (3)^n (n)^2$. **(6.5)**

Q5 (a) Find $Z\{U_n\}$, if $U_n = (n+1)(n+2)(2)^2,\ n \geq 0$. **(6)**

(b) Using Z-transform, solve the difference equation:
$12U_{n+2} - 7U_{n+1} + U_n = 0,\ n \geq 0$ given that $U(0) = 0,\ U(1) = 3$. **(6.5)**

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Unit-III

Q6 (a) Find the smallest positive root of $x^2 - \log_e x - 12 = 0$ by Regula-Falsi method up to two place of decimals. **(6)**

(b) Using Gauss-Siedal method, solve the following system of equations up to fifth iteration
$10x + 2y + z = 9; x + 10y - z = -22; -2x + 3y + 10z = 22.$ **(6.5)**

Q7 (a) From the following table, estimate the number of student who obtained marks between 40 and 45. **(6)**

Marks:	30-40	40-50	50-60	60-70	70-80	80-90
No. of students:	31	42	51	35	31	20

(b) Use Lagrange's interpolation formula, express the function $\frac{3x^2+x+1}{(x-1)(x-2)(x-3)}$ as a sum of partial fractions. **(6.5)**

Unit-IV

Q8 (a) The population of a certain town is shown in the following table:

Year (x):	1931	1941	1951	1961	1971
Population (y):	40.62	60.80	79.95	103.56	132.65

Find the rate of growth of the population in 1961. **(6)**

(b) Using Simpson's one third rule, evaluate $\int_0^1 \frac{dx}{1+x}$. Hence find value of $log_e 2$. **(6.5)**

Q9 (a) Using Taylor's series method find y at $x = 1.1$ and 1.2 by solving $\frac{dy}{dx} = xy + y^2$ given that $y(1) = 2.3$. **(6)**

(b) Using fourth order Runge-Kutta method to solve $\frac{dy}{dx} = xy + y^2, y(0) = 1$. Take interval $h = 0.1$, compute $y\,(0.1)$ and $y\,(0.2)$. **(6.5)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2016

Paper Code: ETCS-203	***Subject: Foundation of Computer Science***

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

Note: Attempt any five questions including Q.no.1 which is compulsory.

Q1 (a) Define the connectives conjunction and disjunction and give the truth table for pVq.
(b) Determine the contrapositive of the statement "If John is a poet, then he is poor."
(c) State and prove the De Morgan's law for a Boolean algebra.
(d) Find DNF for the function $F(x, y, z) = (x + y)z'$.
(e) Define function, domain, Co-domain and range of a function. **(5x5=25)**

Q2 Prove the following:
(a) $n(AUB) = n(A) + n(B) - n(A \cap B)$. **(2.5)**
(b) $p \rightarrow (qVr), (s\Lambda t) \rightarrow q, (qVr) \rightarrow (s \wedge t) then\, p \rightarrow q$. **(5)**
(c) $(\exists x)(p(x) \wedge Q(x)) \Rightarrow (\exists x)(p(x)) \wedge (\exists x)(Q(x))$. **(5)**

Q3 (a) Explain the principle of mathematical induction. **(4)**
(b) Explain the Partial Ordered Relation with the help of suitable example. **(4)**
(c) What is extended pigeonhole principle, explain with suitable example. **(4.5)**

Q4 (a) Explain Vertex coloring problem and chromatic number of graph using example. **(6)**
(b) Show that the minimum number of edges in a connected graph with n vertices is (n-1). **(6.5)**

Q5 (a) Show that all proper subgroups of groups of order 8 must be abelian. **(4)**
(b) Define cyclic group with example. **(4)**
(c) Prove that the group (G,+6) is a cyclic group where $G = \{0,1,2,3,4,5\}$. **(4.5)**

Q6 (a) Draw the Hasse diagram for the divisibility for the divisibility relation on $\{2, 4, 5, 10, 12, 20, 25\}$ starting from the digraph. **(4)**
(b) Define lattice and give an example. **(4)**
(c) Explain principle of inclusion and exclusion with an example. **(4.5)**

Q7 (a) Explain Lagrange's Theorem with proof. **(8)**
(b) Show that the intersection of 2 normal subgroups of a group G is also normal subgroup G. **(4.5)**

Q8 (a) Define Hamiltonian Circuit with Example. **(2.5)**
(b) Give an example of graph which contains a Hamiltonian circuit, but not a Eulerian Circuit. **(5)**
(c) If all the vertices of an undirected graph are each odd degree k, show that the number of edges of the graph is multiple of k. **(5)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2016

Paper Code: ETCS-203	*Subject: Foundation of Computer Science*

Time: 3 Hours *Maximum Marks: 75*

Note: Attempt any five questions including Q.no.1 which is compulsory.

Q1 (a) Define the connectives conjunction and disjunction and give the truth table for pVq.
(b) Determine the contrapositive of the statement "If John is a poet, then he is poor."
(c) State and prove the De Morgan's law for a Boolean algebra.
(d) Find DNF for the function $F(x, y, z) = (x + y)z'$.
(e) Define function, domain, Co-domain and range of a function. **(5x5=25)**

Q2 Prove the following:
(a) $n(AUB) = n(A) + n(B) - n(A \cap B)$. **(2.5)**
(b) $p \rightarrow (qVr), (s\Lambda t) \rightarrow q, (qVr) \rightarrow (s \wedge t) then\ p \rightarrow q$. **(5)**
(c) $(\exists x)(p(x) \wedge Q(x)) \Rightarrow (\exists x)(p(x)) \wedge (\exists x)(Q(x))$. **(5)**

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(b) Explain the Partial Ordered Relation with the help of suitable example. **(4)**
(c) What is extended pigeonhole principle, explain with suitable example. **(4.5)**

Q4 (a) Explain Vertex coloring problem and chromatic number of graph using example. **(6)**
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Q5 (a) Show that all proper subgroups of groups of order 8 must be abelian. **(4)**
(b) Define cyclic group with example. **(4)**
(c) Prove that the group (G,+6) is a cyclic group where $G = \{0,1,2,3,4,5\}$. **(4.5)**

Q6 (a) Draw the Hasse diagram for the divisibility for the divisibility relation on $\{2, 4, 5, 10, 12, 20, 25\}$ starting from the digraph. **(4)**
(b) Define lattice and give an example. **(4)**
(c) Explain principle of inclusion and exclusion with an example. **(4.5)**

Q7 (a) Explain Lagrange's Theorem with proof. **(8)**
(b) Show that the intersection of 2 normal subgroups of a group G is also normal subgroup G. **(4.5)**

Q8 (a) Define Hamiltonian Circuit with Example. **(2.5)**
(b) Give an example of graph which contains a Hamiltonian circuit, but not a Eulerian Circuit. **(5)**
(c) If all the vertices of an undirected graph are each odd degree k, show that the number of edges of the graph is multiple of k. **(5)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2016

Paper Code: ETCS-203	**Subject: Analog Electronic**
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 suitable missing data, if any

Q1 (a) For a silicon diode, calculate the amount by which the diode voltage would have to be increased to double the diode current. **(3)**

(b) Derive an expression for transition capacitance for step-graded junction diode. **(3)**

(c) Explain early effect phenomenon. How does it affect the transistor characteristics? **(3)**

(d) Explain the working of a transistor as a switch. **(3)**

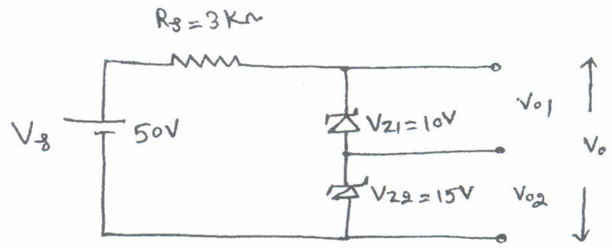
(e) Why FET is called a voltage controlled device? **(3)**

(f) Briefly explain, which of the three BJT configurations has **(6)**
- (i) Highest R_i
- (ii) Lowest R_i
- (iii) Highest R_o
- (iv) Lowest R_o
- (v) Highest A_v
- (vi) Lowest A_v

(g) A differential amplifier has common mode gain $A_c = 0.1$ and difference mode gain $A_d = 200$. Let the input signals be $v_1 = 1050\ \mu v$ and $v_2 = 950\ \mu v$. Compute the output voltage and CMRR **(4)**

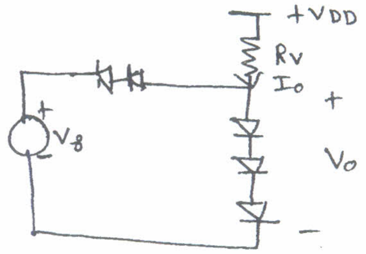
Unit-I

Q2 (a) Consider the Zener diode circuit shown in fig. 2.1 where two ideal Zener diodes with breakdown voltages v_{z1} = 10V and v_{z2} = 15V are connected in series. Determine series current I_s flowing through the resistance R_s = 3 kΩ. Also find v_o, v_{o1}, and v_{o2} for the circuit. **(6.5)**



(b) Draw the circuit diagram of a full-wave rectifier and explain its operation with waveform. Discuss ripple factor and efficiency of rectification. **(6)**

Q3 (a) The diode circuit shown in fig. 2.2 has R_v = 30 kΩ and V_{DD} = 10V. Determine the voltage V_0 and current i_0 if (i) v_s = 5V (ii) v_s = 12 V. Assume a diode drop of V_D = 0.7 V. **(6.5)**



(b) Explain operating principle and V-I characteristics of **(6)**
- (i) Photo diode
- (ii) Zener diode

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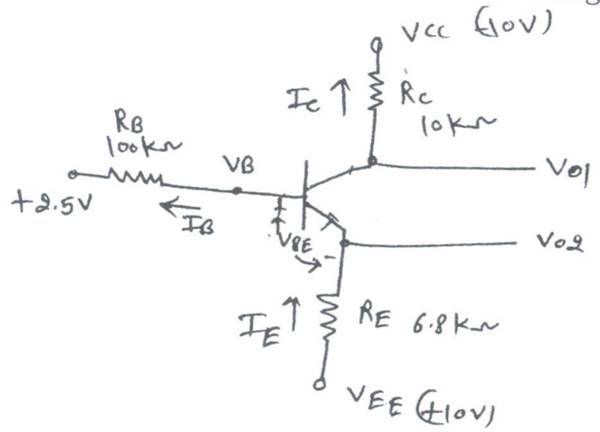
Unit-II

Q4 (a) Compare the common-base, common-emitter and common-collector configurations of a transistor? **(6.5)**

(b) A pnp transistors is shown in fig. 4.1. Find the voltage v_{01} and v_{02}. Assume $\beta_F = 100$. **(6)**



Q5 (a) Define the three stability factors. Explain the cumulative effect of I_{CO}, V_{BE}, and β on the operating point stability. **(6.5)**

(b) Derive the expressions for the stability factor $S(I_{CO})$ for **(6)**

(i) Fixed bias configuration

(ii) Self bias configuration

Unit-III

Q6 Explain the working of R-C coupled amplifier with the help of neat circuit diagrams. Give the frequency response and explain why gain falls at low and high frequencies. **(12.5)**

Q7 (a) Draw the circuit of an enhancement NMOS inverter and explain its characteristics. **(6)**

(b) Determine the operating point (I_{DQ}, V_{DSQ} and V_{GSQ}) for the voltage divider biased n-channel enhancement type MOSFET shown in fig 7.1. It is given that $V_T = 3V$ and $I_D = 5$ mA for $V_{GS} = 6V$. **(6.5)**

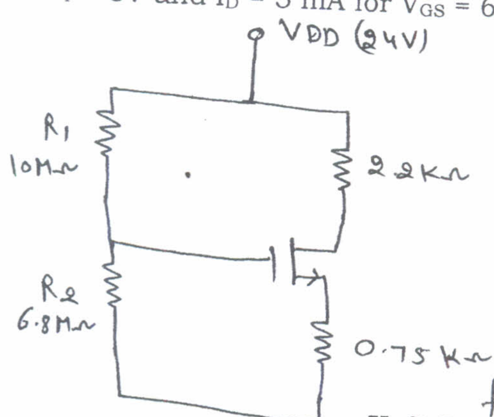


fig-7.1

Unit-IV

Q8 (a) List the main characteristics of an ideal Opamp. **(5)**

(b) Draw the circuit of a practical Opamp integrator and discuss its working. **(7.5)**

Q9 Explain the following OPamp applications: **(6+6.5=12.5)**

(a) Antilog amplifier

(b) Comparator

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ETCS-203

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

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER 2016

Paper Code: ETCS-209	***Subject: Data Structure***
Time: 3 Hours	***Maximum Marks: 75***

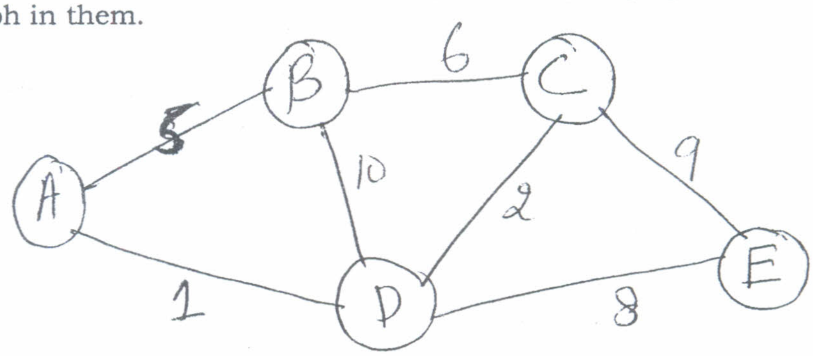
Note: Attempts any five questions including Q no.1 which is compulsory.

Q1 (a) Differentiate between Merge Sort and Quick Sort. **(5)**

(b) Explain terms: sink node, source node, connected and strongly connected graph. **(5)**

(c) What is a height balanced tree? Explain with the help of suitable example. **(5)**

(d) What are the different ways of representing a graph? Generate following graph in them. **(5)**



(e) What is meant by term Row Major Order and Column Major Order in Array? How do we calculate the address of an element in a row major two dimensional array? **(5)**

Q2 (a) Write a procedure/program to reverse a singly linked without using any more memory? **(6)**

(b) Write a program/algorithm to evaluate a postfix expression using stack? Consider the following infix expression and convert into postfix expression using stack.

(A+(B*C-(D/E^F)*G)*H) **(6.5)**

Q3 (a) Consider the Linear Array aaa(5:50), bbb(-5:10) and cc(18). **(8.5)**

(i) Find the number of elements in each array.

(ii) Suppose Base (aaa)=300 and w=4, words for memory cell for aaa. Find the address of aaa[15], aaa[35] and aa[55].

(b) Derive the Time Complexity of the linear search in average and worst case. **(4)**

Q4 Explain the following terms used in tree with example- **(12.5)**

(a) Terminal node/leaf.
(b) Sibling/Brother
(c) Level number
(d) Height/Depth
(e) Degree of Node
(f) Generation
(g) Root
(h) Ancestors and Descendent.

Q5 Construct the AVL tree if following elements are inserted in order. **(12.5)**
10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 150, 130, 15

Q6 What is the role of Binary Search Tree? Give the algorithm for insertion and deletion of a node in binary search tree. Give an example. **(12.5)**

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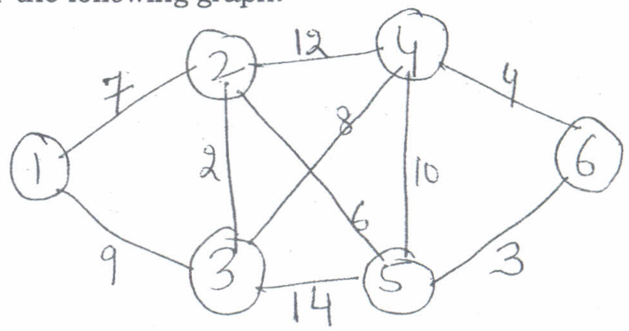
Q7 (a) What do you mean by minimum spanning tree? Generate minimum spanning tree for the following graph. **(6.5)**



(b) Explain Selection sort and Sort the following item using selection sort. **(6)**

8, 22, 7, 9, 31, 19, 5, 13, 58, 93, 1, 45.

Q8 Write down short note on following:- **(6.25x2=12.5)**

(a) Bucket Hashing & Collision Resolution

(b) Circular queue

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2016

Paper Code: ETCS-211	***Subject: Computer Graphics and Multimedia***

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

Note: Attempt any five questions.

Q1 (a) Explain the significance of various data compression techniques in detail with the help of an example for each technique. **(7)**
(b) How is A-Buffer method different from Z-Buffer method? Highlight their roles in back face detection. **(8)**

Q2 Write short notes on **any three** the following: **(5x3=15)**
(a) MIDI
(b) CRT
(c) Specular reflection
(d) Huffman coding

Q3 (a) Highlight the various shading models with the help of an example for each one. **(8)**
(b) How are the parallel projections different from the perspective projections? Briefly describe their sub types. **(7)**

Q4 (a) Are any illumination models needed in computer graphics? If yes, then name them and elaborate the same. **(7)**
(b) Explain in detail the difference between DDA and Bresenham's line drawing algorithm with example. **(8)**

Q5 (a) What are the various 3D Transformations? Explain their significance. **(7)**
(b) What do you understand by window to viewport mapping? Derive equations for scaling and translation factors? **(8)**

Q6 (a) What is Lempel-ziv coding? Explain its functioning with an example? **(7)**
(b) Explain midpoint circle algorithm in detail? Write a short note on the significance of scan conversion algorithms. **(8)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2016 – JANUARY 2017

Paper Code: ETMA-201 ***Subject: Applied Mathematics-III***

(Batch 2013 Onwards)

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

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Use of scientific calculator is allowed.

Q1 (a) Is it possible to expand the function $f(x) = \sin\frac{1}{x}$. In the interval $(-\pi, \pi)$. Explain it. **(5)**

(b) Find the fourier transform of the function $f(x) = e^{-|x|}$. **(5)**

(c) If $y_n = A2^n + B3^n$, derive a difference equation by eliminating the arbitrary constants A and B. **(5)**

(d) Express $y = 2x^3 - 3x^2 + 3x - 10$ in a factorial notation hence show that $\Delta^3 y = 12$. **(5)**

(e) Use Picard method to approximate y when $x = 0.2$ given that $y = 1$ when $x = 0$ and $\frac{dy}{dx} = x - y$. **(5)**

Unit-I

Q2 (a) Expand $f(x) = |\cos x|$ as a fourier series in the interval $-\pi < x < \pi$. **(6.5)**

(b) Find the fourier series for $f(x)$ if $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$

deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots = \frac{\pi^2}{8}$. **(6)**

Q3 (a) Solve the equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + 4$ given u $(4, 0) = 6e^{-3x}$. **(6)**

(b) Obtain the constant term and the coefficient of the first sine and cosine term in the Fourier series of $f(x)$ as given in the following table: **(6.5)**

x	0	1	2	3	4	5
$f(x)$	9	18	24	28	26	20

Unit-II

Q4 (a) Solve $u_{n+2} - 7u_{n+1} + 12u_n = \cos n$. **(6.5)**

(b) Solve the following difference equation

$u_{n+1} + n = 3u_n + 2v_n, V_{n+1} - n = u_n + 2V_n$.

Given $u_0 = 0, V_0 = 3$. **(6)**

Q5 (a) Find $z^{-1}\left\{\frac{z^2}{(z-a)(z-b)}\right\}$ using convolution theorem. **(6.5)**

(b) Solve: $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$. given $y_0 = y_1 = 0$. **(6)**

Unit-III

Q6 (a) Find the real root of the equation $xe^x - 3 = 0$ by Regula Falsi method, correct to three decimal places. **(6.5)**

(b) Use Gauss-Seidel method to solve the system of equations: **(6)**

$3x + y + z = 1$

$x + 3y - z = 11$

$x - 2y + 4y = 21$

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Q7 (a) From the following table, estimate the number of students who obtained marks between 40 and 45. **(6.5)**

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

(b) Using Lagrange's formulae, find the form of the function $f(x)$ given that **(6)**

x	0	2	3	6
$f(x)$	659	705	729	804

Unit-IV

Q8 (a) From the following table, find the value of x for which y is minimum and find this value of y. **(6.5)**

x	1.2	1.3	1.4	1.5	1.6
y	0.9320	0.9636	0.9855	0.9975	0.9996

(b) Evaluate: $\int_0^6 \frac{dx}{1+x^2}$ by using **(6)**

(i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rule.

(iii) Simpson's $\frac{3}{8}$ rule.

Q9 (a) Use Taylor's series method to solve the equation $\frac{dy}{dx} = -xy,\ y(0) = 1$. **(6.5)**

(b) Use the Runge-Kutta fourth order method to find $y(0.2)$ with $h = 0.1$ for the initial value problem $\frac{dy}{dx} = \sqrt{x+y},\ y(0) = 1$. **(6)**

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ETMA-201

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

SUPPLEMENTARY EXAMINATION

THIRD SEMESTER [B.TECH] JANUARY-FEBRUARY 2015

Paper Code: ETCS-203	***Subject: Foundation of Computer Science***

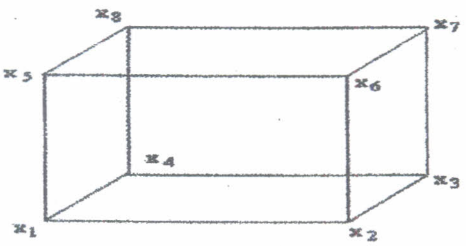
Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt any five questions including Q.no.1 which is compulsory.

Q1 Differentiate between: **(5x5=25)**
(a) Unary relation and binary relation.
(b) Isomorphism and Homomorphism.
(c) Hamilton and Euler graph.
(d) Depth first and Breadth first search.
(e) Proof by Contraposition and proof by contradiction.

Q2 What is Binary Search Tree? Make a BST for the following sequence of numbers. 45, 32, 90, 34, 68, 72, 15, 24, 30, 66, 11, 28, 7. Traverse the BST in Post order. **(12.5)**

Q3 Determine whether the following graph is Hamilton Graph or Euler graph. Also provide the other examples of both type of graphs. **(12.5)**



Q4 State and Proof five color theorem and Illustrate using two examples. **(12.5)**

Q5 (a) Show that if R1 and R2 are equivalence relations on A, then R1 (Intersection) R2 is an equivalence relation. **(6)**
(b) State and proof Euler formula for a connected Graph. Also prove that if |V|>2. then |E|<= 3|V|-6. **(6.5)**

Q6 (a) Draw the Hasse diagram for the poset $(\wp(A), \subset)$ where $A = \{1,2,3,4\}$ and $\wp(A)$ is the power set of A. **(6.5)**
(b) Prove that a simple graph is connected iff it has a spanning tree which contains all nodes. **(6)**

Q7 (a) What is chromatic number? What is the use of this phenomenon in Graph? Explain with the help of an example. **(6)**
(b) Discuss the Boolean function and procedure to minimize the Boolean function. Provide an example to support your answer. **(6.5)**

Q8 Write short note on **any two** of the following: **(2x6.25=12.5)**
(a) Pigeonhole principle
(b) Fermat's Little Theorem
(c) Quadratic congruences and quadratic reciprocity law

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DEC.2014 – JAN.2015

Paper Code: ETCS209	***Subject: Data Structures***
Time : 3 Hours	***Maximum Marks :75***

Note: Attempt any five questions including Q.no.1 which is compulsory.

Q1 Differentiate between the following:- **(5x5=25)**

(a) Prefix and Postfix expression

(b) B Tree and B+ Tree

(c) Linear probe and quadratic probe

(d) Linear and Non-Linear Data Structure

(e) Insertion sort and Selection Sort

Q2 What is the role of Binary Search Tree? Give the algorithm for insertion and deletion of a node in binary search tree. Give an example. **(12.5)**

Q3 Describe the structure of single, doubly and circular linked list. Write the code to construct these linked lists. **(12.5)**

Q4 Compare Quick Sort and Merge sort with respect to advantages and disadvantages. Explain the working mechanism of these sorting methods using example. **(12.5)**

Q5 (a) What are the various parameters on the basis of which an algorithm can be analyzed? **(6)**

(b) Describe any two Hash functions using suitable examples. **(6.5)**

Q6 (a) Use a stack to evaluate the following postfix arithmetic expression. Show the changing status of the stack in tabular form:

$XYZ\wedge{*}+AB/C+-$ for X=1, Y=5, Z=2, A=15, B=3 and C=8 **(6)**

(b) Write any two data structures that are suitable representing a graph. Write an algorithm for Depth First Traversal of a graph using one of your two data structures. **(6.5)**

Q7 (a) Differentiate between Stack and Queue. Write atleast 3 applications of stacks and queue each. **(6)**

(b) What is collision in Hash search? Give two methods to resolve the collision. Find out the complexity of Hash Search. Compare it with Linear Search and Binary Search. **(6.5)**

Q8 Write short notes on **any two** of the following:- **(6.25x2=12.5)**

(a) AVL Tree

(b) 2-3-4 tree

(c) Heap and their properties.

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DEC.2014 – JAN.2015

Paper Code: ETCS-211	*Subject: Computer Graphics and Multimedia*
Time: 3 Hours	*Maximum Marks: 75*

Note: Attempt any five questions including Q no.1 which is compulsory. Select one question from each unit.

Q1 Write short notes on the following:- **(10x2.5=25)**

(a) Differentiate between random scan and raster scan techniques.
(b) Differentiate between Line clipping and Text clipping.
(c) Distinguish between splines curve form Bezier Curves.
(d) Define Synchronization in multimedia system.
(e) Name image compression standards and explain in brief any one.
(f). Give the homogeneous transformation matrices for basic 2D transformations.
(g) What is the difference between image and Video in terms of storage and processing?
(h) What is antialiasing? How it is achieved?
(i) What do you understand by synchronization at content level?
(j) What are he main functions of a Multimedia Development System?

UNIT-I

Q2 Explain DDA Line Drawing Algorithm and its drawbacks with Example. **(12.5)**

Q3 Describe Bresenham's line drawing procedures for lines with slopes > 1. Use the procedure to scan convert a line with end points at [(2,5), (5,10)]. **(12.5)**

UNIT-II

Q4 Explain Cohen-Sutherland line clipping algorithm. Illustrate with an example. **(12.5)**

Q5 Prove that uniform scaling and rotation form a commutative pair of operations. **(12.5)**

UNIT-III

Q6 Explain the various components of multimedia in Audio, Video and images and how multimedia data are can be stored in database in respect of the audio, video and images files. **(12.5)**

Q7 Describe the concepts, frameworks, issues and techniques in multimedia authoring. **(12.5)**

UNIT-IV

Q8 How is multimedia synchronization achieved? Discuss with example the various techniques used. **(12.5)**

Q9 (a) Explain in detail how MPEG is used to compress both audio and video. Give their respective data streams. **(6)**
(b) How MIDI device is used to transmit the information between the components? Explain. **(6.5)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] JANUARY-FEBRUARY 2015

Paper Code: ETCS-211	***Subject: Computer Graphics & Multimedia***

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

Note: Attempt any five questions including Q.no.1 which is compulsory.

Q1 Differential between: **(5x5=25)**
(a) Raster Scan and Random Scan.
(b) B-spline curve and Spline curve.
(c) Z Buffer and A Buffer.
(d) Lossy and Lossless compression.
(e) 2D transformation and 3D Transformation.

Q2 (a) Describe briefly Bresenham's circle drawing algorithm. Why do we prefer incremental algorithm over DDA. **(6.5)**
(b) Distinguish between window port and view port. In 2D clipping, how are lines grouped into visible, invisible and partially visible categories. **(6)**

Q3 (a) Gave a 3X3 homogenous matrix to rotate the image clockwise by 90 degree. Then shift the image to the right by 10 units. Finally scale the image by twice as large. All these transformations are to be done one after another in sequence. **(6.5)**
(b) What is a segment table? How do we create it? Why do we need segments? Explain in detail. **(6)**

Q4 (a) Give control points (10, 100), (50, 100), (70, 120) and (100, 150). Calculate coordinates of any four points lying on the corresponding Beizer curve. **(6)**
(b) Derive simple illumination model. Include the contribution of Diffuse, ambient and specular reflection. **(6.5)**

Q5 (a) Explain the Cohen-Sutherland algorithm. **(6)**
(b) "Cohen-Sutherland algorithm is efficient when outcode testing can be done cheaply." Justify this statement. **(6.5)**

Q6 (a) Write pseudo code for DDA algorithm. **(6)**
(b) Using a suitable example, explain working of this algorithm. **(6.5)**

Q7 (a) Explain the steps involved in carrying out Gourad shading. **(6)**
(b) What are the main disadvantages of this form of shading? How can it be taken care of? **(6.5)**

Q8 Write short note on **any two** of the following: **(2x6.25=12.5)**
(a) Huffman Code
(b) Authoring Tool
(c) Components of Interactive Computer Graphics System.

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END TERM EXAMINATION

THIRD SEMESTER [M.TECH] DECEMBER 2014-JANUARY 2015

Paper Code: ETEL-203	*Subject: Analog Electronics*
Time: 3 Hours	*Maximum Marks: 75*

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

Q1 Answer the following:

(a) Explain the drift and diffusion current for a semiconductor. **(3)**

(b) Explain the following:
(i) Transition capacitance.
(ii) Diffusion capacitance. **(3)**

(c) Define stability factor. Draw a fixed bias circuit and derive an expression for the stability factor. **(4)**

(d) Draw the small signal model of FET at low frequency and explain all the small signal parameters. **(3)**

(e) What is a Darlington transistor? Discuss its salient features. **(3)**

(f) An amplifier requires an input signal of 60mV to produce a certain output. With a negative feedback to get the same output, the required input signal is 0.5V. The voltage with feedback is 90. Find the open loop gain and feedback factor. **(3)**

(g) Explain the following w.r.t. op-amp: **(3)**
(i) CMRR (ii) Slew rate (iii) Gain-bandwidth product.

(h) Draw the output characteristics of CE, CB, CE configurations of transistor. **(3)**

Unit-I

Q2 (a) Draw D.C load line for a CE transistor. Explain the reason for selecting Q point in the middle of the D.C load line. Also discuss the reasons which lead to shift in Q point. **(6)**

(b) In a CE transistor amplifier circuit, the bias is provided by self bias. If the various parameters are V_{CC} = 12V, R1 = 10kΩ, R2 = 5kΩ, R_C = 1kΩ, R_E = 2kΩ, and β = 100, find the (i) the coordinates of the operating point, (ii) the stability factor, assuming the transistor to be silicon. **(6.5)**

Q3 (a) Draw the hybrid model for CB configuration at low frequencies and determine the h-parameters from the characteristics configuration. **(6)**

(b) What are different coupling schemes used in amplifiers? Draw the equivalent circuit for RC coupled amplifier in the mid frequency range and derive the equation for voltage gain A_{VM}. **(6.5)**

Unit-II

Q4 (a) What are multistage amplifiers? Describe the benefits of using the multiple transistor stages. **(6)**

(b) Draw the cascade amplifier circuit and derive expressions for voltage gain, current gain, input impedance and output impedance. **(6.5)**

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Q5 Discuss the effect of negative feedback on the following amplifier characteristics:
(a) Voltage gain (b) Bandwidth (c) Non-linear distortion (d) Input impedance (e) Output impedance (f) Noise. **(12.5)**

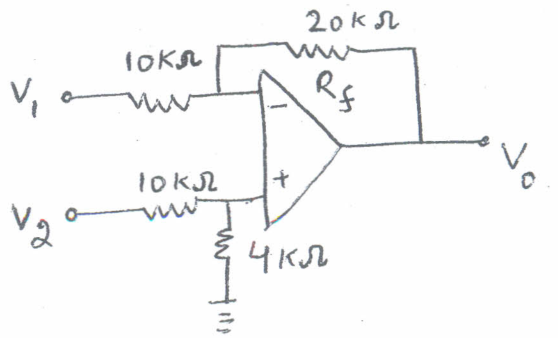
Unit-III

Q6 (a) Draw and explain the drain and transfer characteristics of enhancement and depletion type MOSFET. **(6.5)**
(b) In a self-bias N-channel JFET circuit, the operating point is to be set at I_D = 1.5mA and V_{DS} = 10V. The JFET parameters are I_{DSS} = 5mA and V_P = -2V. Find the values of R_S and R_D. Given that V_{DD} = 20V. **(6)**

Q7 (a) Draw the circuit diagram of complementary symmetry class-B push-pull amplifier and explain its principle of operation. **(6.5)**
(b) Derive the equation for (i) Conversion efficiency (ii) Maximum value of efficiency of class A transformer coupled amplifier. **(6)**

Unit-IV

Q8 (a) Draw the block diagram of op-amp and explain all the stages. **(6.5)**
(b) (i) Draw the basic circuit of three-opamp instrumentation amplifier. Describe its operational principle.
(ii) Find the output voltage of the following op-amp circuit shown in the fig below: **(6)**



Q9 Using op-amp, explain the following:
(a) Inverting Amplifier. **(4)**
(b) Integrator. **(4)**
(c) Astable multivibrator. **(4.5)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2014-JANUARY 2015

Paper Code: ETMA-201	*Subject: Applied Mathematics-III*
Time: 3 Hours	*Maximum Marks: 75*

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Use of scientific calculator is allowed.

Q1 (a) State Dirchlet Condition for convergence of Fourier series. **(3)**

(b) Show that $F\{x^n f(x)\} = i^n . \frac{d^n}{d\omega^n}[f(\omega)]$

Where $F(w) = F\{f(x)\}$ is Fourier transform of $f(x)$. **(4)**

(c) Show that $Z\left(\frac{1}{(n+2)!}\right) = z^2\left(e^{1/z} - 1 - z^{-1}\right)$.

(d) Find the difference equation corresponding to the family of curves. **(3)**

$y = ax + bx^2$. **(5)**

(e) Find the value of π correct upto 4th decimal place from $\int_0^1 \frac{1}{1+x^2}\,dx$ using Trapezoidal rule in 10 intervals. **(5)**

(f) Apply Newton-Raphson formula to solve the equation $x^2 + 4\sin x = 0$ to get a real root correct upto 4th decimal place. **(5)**

Unit-I

Q2 (a) Obtain Fourier Series for the function $f(x) = x^2 + x,\ x \in [-\pi, \pi]$ and deduce from it. $\frac{\pi^2}{6} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \ldots\ldots..$ **(6.5)**

(b) Express $f(x) = x$ as half range cosine series for $0 < x < 2$. **(6)**

Q3 (a) Find Fourier transform of $f(x) = \begin{cases} 1 - x^2 & |x| < 1 \\ 0 & |x| \geq 1 \end{cases}$

Hence show that $\int_0^{\infty} \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2}\,dx = \frac{3\pi}{16}$. **(6.5)**

(b) Solve the equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}, x > 0,\ t > 0$ subject to the boundary condition $u(0,t) = f(t)$ and the initial condition $u(x,0) = 0$. **(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 transform of $\frac{2z^2+3z}{(z+2)(z-4)}$ **(6)**

(b) Solve using z-transform:

$y_{n+2} - 4y_{n+1} + 4y_n = 2^n$, given that $y_0 = 0,\ y_1 = 1$. **(6.5)**

Unit-III

Q6 (a) Solve $x^3 - x^2 - 1 = 0$ using Regula Falsi method correct upto 4th decimal place. **(6)**

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(b) Use Gauss-Seidal method to solve the system of equation
$5x + 2y + z = 12, \; x + 4y + 2z = 15, \; x + 2y + 5z = 20.$
Correct upto 4th decimal place. **(6.5)**

Q7 (a) Find $y'(0)$ & $y''(0)$ from the table: **(6)**

x:	0	1	2	3	4	5
y:	4	8	15	7	6	2

(b) Compute $\log_{10} 323.5$ from the table: **(6.5)**

x:	321.0	322.8	324.2	325.0
$\log_e x$:	2.5065	2.5089	2.5108	2.5119

Unit-IV

Q8 (a) Using Simpson's one-third rule evaluate $\int_0^{\pi/2} \sin x \, dx$ upto 4th decimal place in 10 intervals. **(6)**

(b) Apply Taylor's method to find $y(0.2)$ from $y' - 4y = 0$ given that $y(0) = 1$. **(6.5)**

Q9 (a) Apply modified Euler's method to find y(0.3) given that $\frac{dy}{dx} = x + y, \; y(0) = 1.$ **(6)**

(b) Use Runge-Kutta method of 4th order to solve; $\frac{dy}{dx} = 1 + y^2, \; y(0) = 0$ to find $y(0.6)$ in 3 steps. **(6.5)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.(LATERAL ENTRY)] JANUARY 2015

Paper Code: ETMA201	Subject: Applied Mathematics-III
Time : 3 Hours	Maximum Marks :75

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each unit.

Q1 Answer all the parts:-

(a) Find the Fourier transform of $f(x)=\begin{cases}1 & for|x|<1\\ 0 & for|x|>1\end{cases}$. **(3)**

(b) Express f(x)=x as a half-range sine series in 0<x<2. **(3)**

(c) Solve the difference equation $y_{n+2}-2y_{n+1}+y_n=n^2 2^n$. **(3)**

(d) Use Convolution theorem to evaluate $Z^{-1}\left(\frac{z^2}{(z-a)(z-b)}\right)$. **(3)**

(e) Perform two iterations to find the fourth root of 32, using the Regular Falsi method. **(3)**

(f) Determine f(x) as a polynomial in x for the following data:- **(3)**

x	-4	-1	0	2	5
f(x)	1245	33	5	9	1335

(g) Solve $\frac{dy}{dx}=y-\frac{2x}{y}$; $y(0)=1$ at 0.1 using Euler method. **(3)**

(h) A solid of revolution is formed by rotating about x axis, the area between the x-axis, the lines x=0, x=1 and a curve through the points with the following coordinates:-

x	0	0.25	0.5	0.75	1
y	1	0.9896	0.9589	0.9089	0.8415

Estimate the volume of solid using Simpson's 1/3 rule. **(4)**

UNIT-I

Q2 (a) Find the Fourier Series of the function $f(x)=\begin{cases}0, & -2<x<-1\\ 1+x, & -1<x<0\\ 1-x, & 0<x<1\\ 0, & 1<x<2\end{cases}$. **(6.5)**

(b) Given that $f(x)=x+x^2$ for $-\pi<x<\pi$ find the Fourier expansion of f(x).

Deduce that $\frac{\pi^2}{6}=1+\frac{1}{2^2}+\frac{1}{3^2}+......$ **(5+1=6)**

Q3 (a) Find the Fourier transform of $e^{-|x|}$. Hence show that $\int_0^\infty \frac{x\sin mx}{1+x^2}dx=\frac{\pi e^{-m}}{2}$, m>0. **(5+1.5=6.5)**

(b) Using Finite Fourier transform, solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ given-

u(0,t)=0=u(4,t); u(x,0)=2x, 0<x<4, t>0. **(6)**

P.T.O.

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UNIT-II

Q4 (a) Find the Z transform and region of convergence of $u(n) = \begin{cases} 4^n & for\ n < 0 \\ 2^n & for\ n \geq 0 \end{cases}$. **(6)**

(b) Find the inverse Z transform of $\frac{2(z^2 - 5z + 6.5)}{(z-2)(z-3)^2}$ for $2 < |z| < 3$. **(6.5)**

Q5 (a) Using Z transformation solve $y_{n+2} - 2y_{n+1} + y_n = 3n + 5$. **(6.5)**

(b) Solve $y_{n+2} - 2\cos\alpha y_{n+1} + y_n = \cos\alpha n$. **(6)**

UNIT-III

Q6 (a) Solve by Jacobi's iteration method, the following system of equations:

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25$ **(6)**

(b) Find by Newton's method, the real root of the equation $3x = \cos x + 1$. **(6.5)**

Q7 (a) One entry in the following table is incorrect and y is a cubic polynomial in x. Use the difference table to locate and correct the error: **(6)**

x	0	1	2	3	4	5	6	7
y	25	21	18	18	27	45	76	123

(b) The following table gives the values of density of saturated water for various temperatures of saturated steam:-

T=temp ^{0}C	100	150	200	250	300
d=density (hg/m^3)	958	917	865	799	712

Find by interpolation the densities when temperatures are 130^{0}C and 275^{0}C respectively. **(6.5)**

UNIT-IV

Q8 (a) Using Runge-Kutta method of fourth order, solve for y(0.1) given that $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$. **(6)**

(b) From the given data, find the maximum value of y: **(6.5)**

x	-1	1	2	3
y	-21	15	12	3

Q9 (a) Using Taylor's series method, solve $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$ at $x = 0.1, 0.2$. **(6.5)**

(b) The velocity v of a particle at a distance s from a point on its path is given by the following table:-

s(ft)	0	10	20	30	40	50	60
v(ft/s)	47	58	64	65	61	52	38

Estimate the time taken to travel 60ft using Trapezoidal rule. **(6)**

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DEC. 2014- JAN. 2015

Paper Code: ETMA-201	Subject: Applied Mathematics-III (2004-2012)

Time: 3 Hours Maximum Marks: 75

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

Q1 (a) Find Laplace transform of $e^{-t}\sin U(t-\pi)$. **(9x3=27)**

(b) If $L^{-1}\left(\frac{1}{s^2+4}\right) = \frac{1}{2}\ sin2t$, using this find $L^{-1}\left(\frac{s}{s^2+4}\right)$.

(c) State the reasons whether the function $f(x) = cosec\ x, -\pi \le x \le \pi$ can be expanded in Fourier series.

(d) Define Fourier integral in complex form.

(e) Prove that $\Gamma(n+1) = n\Gamma n$.

(f) Prove that $B(m,n) = B(m,n+1) + B(m+1,n)$.

(g) Prove that $J_{-n}(x) = (-1)^n J_n(x)$, where n is an integer.

(h) Express $f(x) = 3x^3 - x^2 + 5x$-2 in terms of Legendre's polynomials.

(i) Form a partial differential equation by eliminating the arbitrary function from $z = y^2 + 2f\left(\frac{1}{x} + logy\right)$.

Unit-I

Q2 (a) If $f(t)$ is a periodic function with period T, then prove that **(6)**

$$L\,[f(t)] = \frac{1}{(1-e^{-sT})}\int_0^T e^{-st}f(t)\,dt.$$

(b) Using Laplace transform, solve the differential equation $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t$, given that $x = 2, \frac{dx}{dt} = -1$ at $t = 0$. **(6)**

Q3 (a) If $L[f(t)] = f(s)$, then prove that $L\left[\frac{f(t)}{t}\right] = \int_s^\infty f(s)\,ds$. Hence evaluate $L\left(\frac{1-e^t}{t}\right)$. **(6)**

(b) Evaluate the following:

(i) $L^{-1}\left(\frac{se^{-s/2}+\pi e^{-s}}{s^2+\pi^2}\right)$ (ii) $L\left(t\int_0^t \frac{e^{-t}\sin t}{t}dt\right)$. **(6)**

Unit-II

Q4 (a) Expand $f(x) = \sqrt{1-\cos x}$,$0 < x < 2\pi$ in a Fourier series. Hence evaluate $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \dots\dots\dots$ **(6)**

(b) Obtain Fourier series for the function *f(x)* given by $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi \le x \le 0 \\ 1 - \frac{2x}{\pi}, & 0 \le x \le \pi \end{cases}$.

Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$. **(6)**

P.T.O.

ETMA-201

P.1/2

Q5 (a) Find Fourier integral representation of the function $f(x) = \begin{cases} 1 & , |x| < 1 \\ 0 & , |x| > 1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin \lambda \cos \lambda x}{\lambda} d\lambda$. **(6)**

(b) Find the Fourier transform of $f(x) = e^{-x^2}$. **(6)**

Unit-III

Q6 (a) Show that $\int_0^\infty x^{m-1} \cos ax \, dx = \frac{\Gamma m}{a^m} \cos\left(\frac{m\pi}{2}\right)$. **(6)**

(b) State and prove orthogonal property of Bessel's function. **(6)**

Q7 (a) State and prove Rodrigue's formula for Legendre's polynomials. **(6)**

(b) Prove that $(2n+1)\, xP_n(x) = (n+1)P_{n+1}(x) + nP_{n-1}(x)$. **(6)**

Unit-IV

Q8 (a) Form a partial differential equation by eliminating the arbitrary function from $f(x+y+z,\ x^2+y^2+z^2) = 0$. **(6)**

(b) A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 sin^3\left(\frac{\pi x}{l}\right)$ is released from rest from this position, find the displacement $y\,(x,t)$. **(6)**

Q9 (a) Using method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, where $u\,(x,0) = 6e^{-3x}$. **(6)**

(b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with boundary conditions.
$u(x,0) = 3\sin(n\pi x), u(0,t) = 0$ and $u(1,t) = 0,\ where\ 0 < x < 1, t > 0$. **(6)**

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ETMA-201
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(Please write your Exam Roll No.) *Exam Roll No. ....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DEC.2014-JAN.2015

Paper Code: ETCS-203	*Subject: Foundation of Computer Science*

Time: 3 Hours *Maximum Marks: 75*

Note: Attempt any five questions including Q.no.1 which is compulsory. Internal choice is indicated.

Q1 Answer the following:

(a) Define Predicates and Quantifiers. Give an example for each. **(3)**

(b) Prove by contradiction that at least four of any 22 days must fall on the same day of the week. **(3)**

(c) Explain principle of inclusion and exclusion with an example. **(3)**

(d) Give an example for the following:

(i) Representing Relations Using Matrices.

(ii) Representing Relations Using Digraphs. **(3)**

(e) Define Principle of Mathematical Induction. **(3)**

(f) Give the proof for five color theorem. **(3)**

(g) Mention the axioms to be satisfied in a ring R. **(4)**

(h) Define automorphism. Give an example for illustration. **(3)**

Q2 (a) Give an example to illustrate proofs by Contraposition and Contradiction methods. **(6)**

(b) Mention the Rules of Inference for Propositional Logic. **(4)**

(c) Let m, n be two positive integers. Prove that if m, n are perfect squares, then the product m*n is also a perfect square. **(2.5)**

OR

Q3 (a) Provide a proof by contradiction for the following:

For every integer n if n^2 is odd, then n is odd. **(5)**

(b) Let A = {1, 2, ..., 9, 10}. Consider each of the following sentences. If it is a statement, then determine its truth value. If it is a propositional function, determine its truth set. **(5)**

(i) $(\forall x \in A)(\exists y \in A)(x + y < 14)$

(ii) $(\forall x \in A)(\forall y \in A)(x + y < 14)$

(iii) $(\forall x \in A)(x + y < 14)$

(iv) $(\exists y \in A)(x + y < 14)$

(c) Define De Morgan's Laws. Find the negation of $P \leftrightarrow Q$. **(2.5)**

Q4 (a) Draw the Hasse diagram representing the partial ordering {(a, b) |a divides b} on {1, 2, 3, 4, 6, 8, 12}. **(5)**

(b) Let A, B and C be any three subsets of the universal set U. Then prove that:

(i) $A - (B \cup C) = (A - B) \cap (A - C)$

(ii) $(A \cap B) - C = A \cap (B - C)$ **(5)**

(c) What is the power set of the set {0, 1, 2}? **(2.5)**

P.T.O.

ETCS-203

P1/2

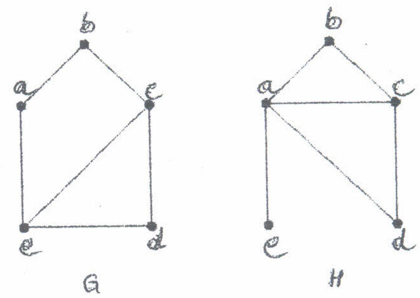
OR

Q5 (a) Using Pigeonhole principle calculate the following:
(i) How many cards must be selected from a standard deck of 52 cards to guarantee that at least three cards of the same suit are chosen?
(ii) How many must be selected to guarantee that at least three hearts are selected? **(5)**
(b) Define composition of functions. Prove that composition of functions is not commutative. **(5)**
(c) Is the poset $(Z^+, |)$ a lattice? **(2.5)**

Q6 (a) Develop a general explicit formula for a non-homogeneous recurrence relation of the form $a_n = ra_{n-l} + s$. Where r and s are constant. **(5)**
(b) Prove by mathematical induction: For every positive integer n, the expression $2^{n+2} + 3^{2n+1}$ is divisible by 7. **(5)**
(c) Define Linear recurrence relations with constant coefficients. Give an example with illustration. **(2.5)**

OR

Q7 (a) Show that the edge chromatic number of a graph must be at least as large as the maximum degree of a vertex of the graph. **(2.5)**
(b) Prove the Euler Formula. **(2.5)**
(c) Show that the graphs displayed in the following figures are not isomorphic: **(5)**



(d) Define Euler and Hamiltonian paths in a graph. **(2.5)**

Q8 (a) If f is a homomorphism from a commutative semigroup (S, *) onto a semigroup (T, *′), then (T, *′) is also commutative. **(2.5)**
(b) Define groups, sub-groups and normal sub-groups. Give an example for each. **(6)**
(c) State Cayles's Theorem and explain using an example. **(4)**

OR

Q9 (a) Give an example to represent and minimize the Boolean function. **(5)**
(b) Prove Lagrange's theorem. **(5)**
(c) Show that in a ring R: (i) (-a) (-b) = ab; (ii) (-1) (-1) = 1, if R has an identity element 1. **(2.5)**

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ETCS-203
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