

FLAT



Rajiv Gandhi University of Knowledge Technologies,
Ongole Campus

E2 (2017 BATCH) SEM2 MID1 EXAMINATIONS, Aug 2021
SUBJECT: FLAT

DATE: 23-08-2021(FN)

Time : 120 min

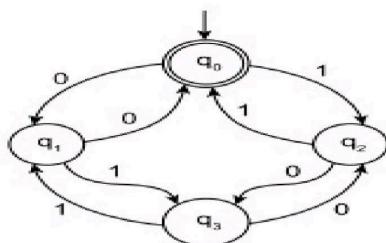
Max. 40 Marks

BRANCH: CSE

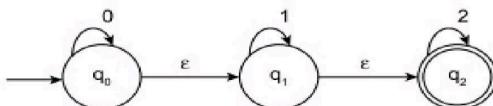
Instructions: Answer any four questions of the following

4X10=40 Marks

- 1 Explain the design of a finite state machine with an example? 10M
- 2 What are different types of languages and list the machines that recognize the languages 10M
- 3 Check the input string **1011001011** is accepted by given finite automata. 10M



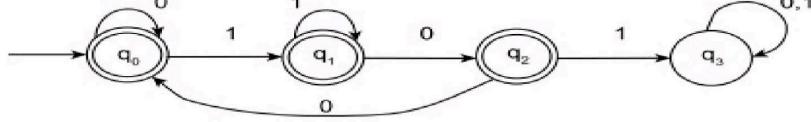
- 4 Design NFA for language $L=\{0^k \mid k \text{ multiples of } 4 \text{ or } 5\}$ 10M
- 5 Convert NFA-Epsilon transitions to NFA-without-Epsilon transition 10M



- 6 Convert the following NFA to a DFA. 10M

δ	0	1
$\rightarrow q_0$	$\{q_1, q_2\}$	$\{q_0\}$
q_1	$\{q_0, q_1\}$	\emptyset
$*q_2$	$\{q_1\}$	$\{q_0, q_1\}$

- 7 Define a regular expression and find a regular expression for the language $L = \{w \mid w \in \{0,1\}^*\}$ where w has no pair of consecutive zeroes. 10M
- 8 Find the regular expression for the DFA 10M



6 Convert the following grammar to an equivalent PDA: 10M

$S \rightarrow aABC$

$A \rightarrow aB \mid a$

$B \rightarrow bA \mid b$

$C \rightarrow a$

7 Design a Turing machine to accept the language $L = \{a^n b^n c^n : n \geq 1\}$. Also give the graphical representation and ID for the input 'aabbc'. 10M

8 Define UNIVERSAL TURING MACHINE. What is a Turing machine? With a neat sketch, explain the working of a Turing machine. 10M



Rajiv Gandhi University of Knowledge Technologies,
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E2 (2017 BATCH) SEM2 MID1 EXAMINATIONS, Aug 2021
SUBJECT: FLAT

DATE: 17-09-2021(FN)
BRANCH: CSE

Time : 120 min
Max. 40 Marks

Instructions: Answer any four questions of the following

4X10=40 Marks

1 Give CFG for RE $(011 + 1)^* (01)^*$ 10M

2 Find the language and derive abbaaba from the following grammar: 10M

terminals: a, b

non-terminals: S, X

productions: $S \rightarrow XaaX$

$$X \rightarrow aX \mid bX \mid e$$

3 Consider the CFG $(\{S, X\}, \{a, b\}, P, S)$ where productions are 10M

$$S \rightarrow baXaS \mid ab$$

$$X \rightarrow Xab \mid aa$$

Find LMD and RMD for string $w = baaaababaab$

4 Convert the CFG to GNF $S \rightarrow ABA$ 10M

$$A \rightarrow aA \mid \epsilon$$

$$B \rightarrow bB \mid \epsilon$$

5 Convert CFG to PDA. 10M

$$I \rightarrow a \mid b,$$

$$S \rightarrow aA,$$

$$A \rightarrow aABC \mid bB \mid a,$$

$$B \rightarrow b,$$

$$C \rightarrow c$$

**PART-A****Instructions: Choose the correct choice** **$18 \times 1 = 18$ Marks**

- 1) Which of the following is an application of Finite Automaton?
 a) Compiler b) Loader c) Linker d) Debugger
- 2) In Finite Automata Alphabet is denoted with the symbol
 a) A b) Σ c) δ d) *
- 3) in Finite Automata Transition function maps.
 a) $\Sigma^* Q \rightarrow \Sigma$ b) $Q^* Q \rightarrow \Sigma$ c) $\Sigma^* \Sigma \rightarrow Q$ d) $Q^* \Sigma \rightarrow Q$
- 4) There are _____ tuples in finite state machine
 a) 4 b) 5 c) 6 d) unlimited
- 5) The transitions which does not take an input symbol are called _____
 a) ϵ b) λ c) ϵ or λ d) none
- 6) In Moore Machine Output is associated with _____
 a) Present state b) Next state c) Input d) None of the mentioned
- 7) The Regular Expression gives none or many instances of an x or y is?
 a) $(x+y)^*$ b) $(x+y)^*$ c) $(x^* + y)$ d) $(xy)^*$
- 8) The identity Rule " $RR = ?$ "
 a) R b) R^* c) R^+ d) RR
- 9) A language is regular if and only if
 a) accepted by DFA b) accepted by PDA c) accepted CFL d) accepted by Turing machine
- 10) Strings of 0's and 1's with at least two consecutive 0's
 a) $(0+1)^*00(0+1)^*$ b) $00(0+1)^*$ c) $(0+1)^*(0+1)^*$ d) $(0+1)^*00$
- 11) Regular Grammar is defined as $G=(V, T, P, S)$. V represents?
 a) Terminals b) Non terminal c) Vertices d) Variable
- 12) A grammar is called ambiguous if
 a) It generates more than one string b) It generates both left & right most derivations
 c) It generates more than one parse tree for a given string d) both (b) and (c)
- 13) Which of the following production is in CNF?
 a) $(NP) \rightarrow (\text{String of NT})$ b) $(NT) \rightarrow (\text{String of terminal and non-terminal})$
 c) $(NT) \rightarrow (\text{String of terminal})$ d) $(NT) \rightarrow (\text{String of exactly two NT})$
- 14) Useless symbols in CFG are
 a) Non-generating and non-reachable symbol b) Null alphabets and null string
 c) Non-terminal symbols d) All of these
- 15) Which is not true for mechanical diagram of PDA?
 a) PDA contains a stack b) The head reads as well as writes
 c) The head moves from left to right d) The input string is surrounded by blanks
- 16) In the PDA, transitional function δ is in the form
 a) $Q \times (\Sigma \cup \{\lambda\}) \times \Gamma \rightarrow (Q, \Gamma)$ b) $Q \times \Sigma \rightarrow Q$
 c) $Q \times \Sigma \times \Gamma \rightarrow Q$ d) $Q \times \Gamma \rightarrow Q \times \Sigma$
- 17) The difference between the Turing machine and the push down automata is in the
 a) Head movement b) Finite control c) Stack d) All of these
- 18) In the Turing machine, the transitional function δ is in the form
 a) $Q \times \Gamma \rightarrow (Q \times \Gamma \times \{L, R, H\})$ b) $Q \times \Sigma \rightarrow (Q \times \{L, R, H\})$
 c) $Q \times \Sigma \rightarrow (Q \times \Sigma \times \{L, R, H\})$ d) $Q \times \Gamma \rightarrow (Q \times \Sigma \times \{L, R, H\})$

PART-B

Answer any SIX questions of the following, Each question carries Seven Marks

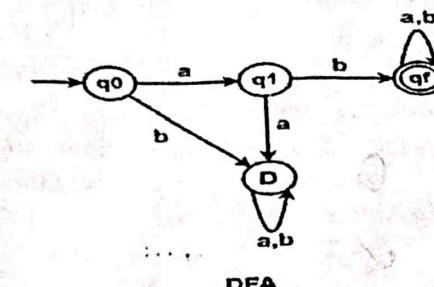
6X7=42 M

3M

1) a) Define Finite state machine , write in detail about Finite state model?

4M

b) Write Transition table for the below Transition diagram and
check string acceptance for "abbbbbbabbb"



2) Define DFA & NFA with examples ? Construct DFA which accepts equal number of 0's & equal number of 1's ? 7M

3) a) Convert the following NFA to DFA (4M) b) Check whether the two Automaton-1 & Automaton-2 are equivalent are not? 3M

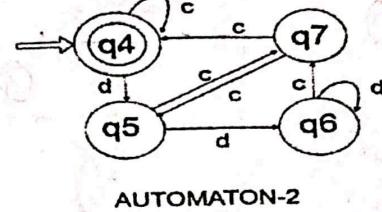
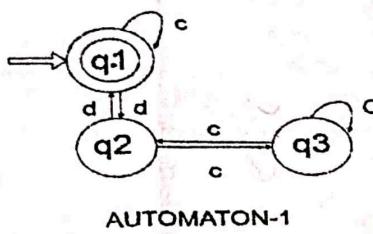
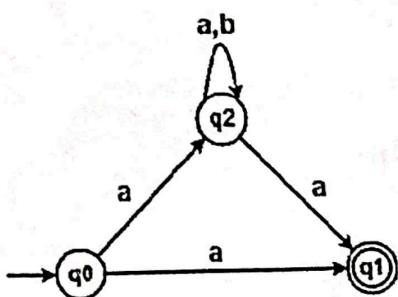
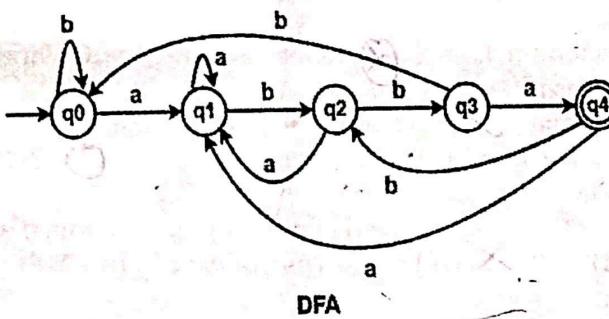


FIGURE -2

4) Construct MOORE machine to determine the residue Modulo-3 for binary number& check the string acceptance? 7M

5) a) Construct Regular Expression for the following Finite Automata? 4M



b) Write steps to convert Regular expression to Finite Automata? 3M

6) a) write the closure properties of Regular sets 3M

b) Show that the Language $L=\{a^n b^{2n} / n>0\}$ is not regular{by applying pumping lemma} 4M

7) Define Right linear ,Left linear Grammar with an example &Construct Left linear grammar for the following

Grammar $S \rightarrow aA|bB, A \rightarrow bA|a, B \rightarrow b, A \rightarrow bS$ 7M

8)Write the rule of Greibach Normal form and Convert the following CFG to GNF $S \rightarrow AB, A \rightarrow BS/b, B \rightarrow SA/a$ 7M

9) a) Define Push Down Automata ? Explain Conceptual Model of Push Down Automata and Elements of PDA? 2M

b)Construct a Push down automata to accept the language $L = \{a^n b^n c^n, \text{ where } n \geq 1\}$ by the empty stack and by the final state. 5M

10) a) Write the steps for construction of PDA from CFG 3M

b) Construct an equivalent PDA for the following context-free grammar. 4M

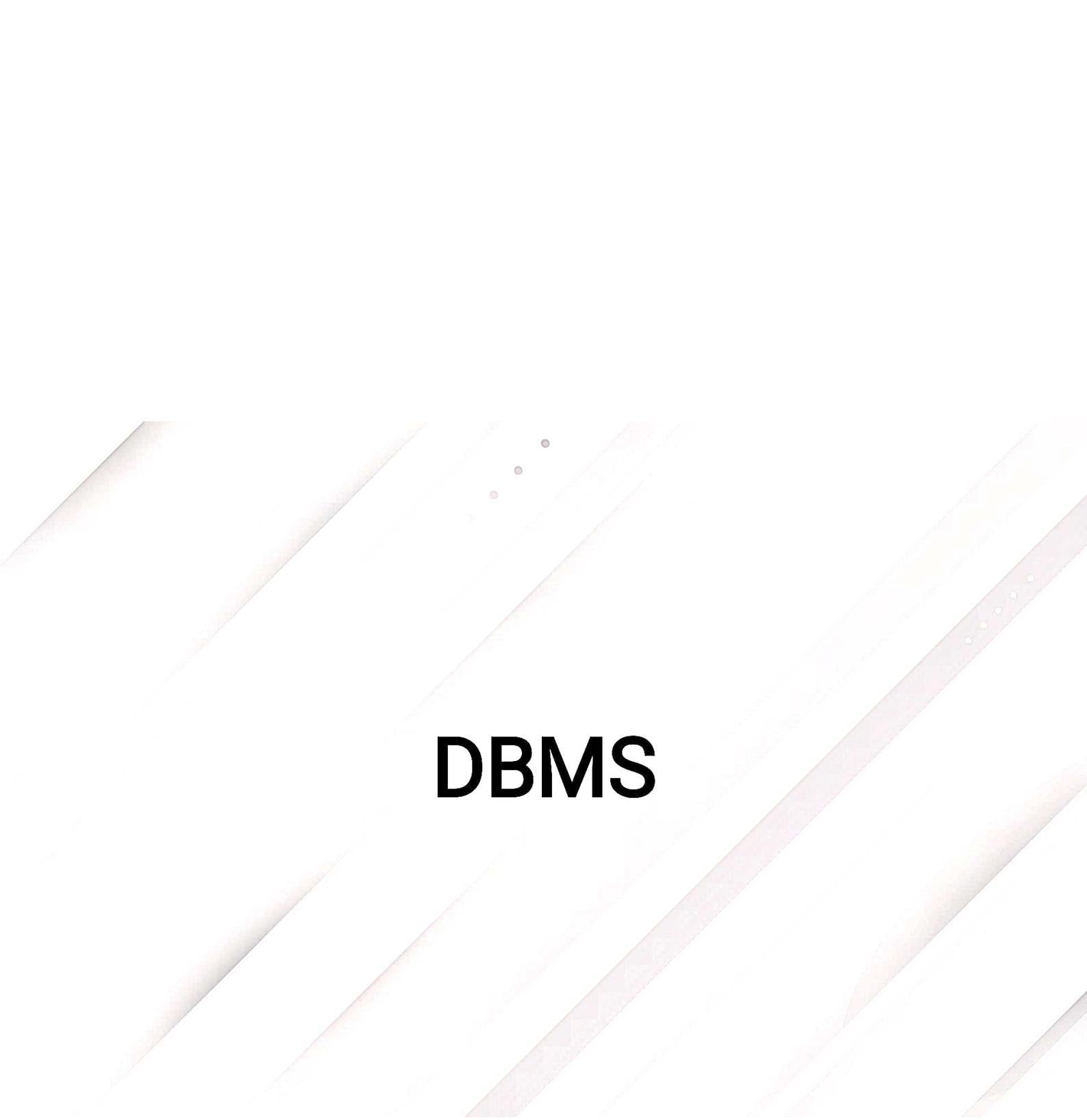
$S \rightarrow aAB/bBA \quad A \rightarrow bS/a \quad B \rightarrow aS/b$

11) a) Define Turing Machine ? Explain elements and Mechanical diagram of Turing Machine? 3M

b) Design a Turing Machine for the Language $L=\{anb2n/n \geq 1\}$ 4M

12) a) Write Church's Hypothesis ? 3M

b) Explain Universal Turing Machine with an example? 4M



The background features a series of overlapping diagonal bands in various colors, including light blue, pink, and white. Small, semi-transparent colored dots (pink, purple, and grey) are scattered across the bands, creating a sense of depth and motion.

DBMS



**Rajiv Gandhi University of Knowledge Technologies,
Ongole Campus.**

E2 (2017 BATCH) SEM2 MID1 EXAMINATIONS, Aug 2021

SUBJECT: Database Management Systems

DATE: 21-08-2021(FN)

Time: 120 min

BRANCH: CSE

Max. 40 Marks

Instructions: Answer any four questions of the following

4X10=40 Marks

1. a. What is DBMS and what are the advantages of database systems when compared with file management systems. (8 M)
 b. Write an SQL query to find the topper in each department
 Student(s_id, s_name, dept, contact)
 Results(s_id, cgpa, grade) (2 M)
2. a. Write a note on simple and extendable relational algebraic operations. (10 M)
3. a. Discuss about constraints in SQL language with examples. (7 M)
 b. Write a relational algebraic query to find the list of student names and id numbers who enrolled for same subject in both even and odd semesters.
 Semester (id, name, dept, sem, subject_name) [HINT: don't use set intersection operator] (3 M)
4. a. Draw an ER diagram for examination results systems. (6 M)
 b. Write the difference between i) Join and Cartesian product ii) Projection and extendable projection iii) Where and having clauses iv) Procedural and non-procedural language. (4 M)
5. a. Write relational algebra and tuple relational queries based on the relations "Student (s_id, s_name, dept, contact)" and "Results(s_id, cgpa, grade)" for following questions.
 i) Find all the student ids and names that has cgpa between 7 and 8.
 ii) Find all the student ids and names that has grade "A".
 b. Write a short note on data abstraction layers of database systems. (5 M)
6. a. Write DDL queries to construct the relations for the following relational design. (5 M)
 employee (employee_id, employee_name (not null), street, city)
 works (employee_id references employee, company_name references company, salary)
 company (company_id, company_name (unique, not null), city)
 manages (employee_id references employee, manager_name (not null))
 b. Write a short on data models. (5 M)
7. a. Write a short note on aggregate function in SQL. (5 M)
 b. How to convert an ER diagram into relational design with an example? (5 M)
8. a. Discuss about database languages. (4 M)
 b. Discuss about the views in SQL. (6 M)



Rajiv Gandhi University of Knowledge Technologies,
Ongole Campus.

E2 (2017 BATCH) SEM2 MID2 EXAMINATIONS, Sep 2021

SUBJECT: Database Management Systems

DATE: 15-09-2021(FN)

Time: 120 min

BRANCH: CSE

Max. 40 Marks

Instructions: Answer any four questions of the following

4X10=40 Marks

- 1 What is a B+Tree? Describe the properties of B+trees and explain it with an **10M** example?

- 2 Define functional dependency? Explain the types and properties of functional dependencies? **10M**

- 3 What is a transaction? Explain the transaction properties and states. **10M**

- 4 What is RAID? Explain the RAID levels. **10M**

- 5 Explain the serializability with an example. **10M**

- 6 Given a Relation R= (A, B, C, D, E) and Functional Dependencies are: F = {BC→D, AC→BE, B→E} Determine all Candidate keys of R and the highest normal form of R with proper explanation. **10M**

- 7 How to handle bucket overflow in a hash based indexing mechanism? Explain. **10M**

- 8 What is decomposition? Explain the types of decomposition with an example. **10M**



DLD



Rajiv Gandhi University of Knowledge Technologies,
Ongole Campus

E2 (2017 BATCH) SEM1 MID2 EXAMINATIONS, July 2021

SUBJECT: Digital Logic Design

DATE: 08-08-2021(AN)

Time : 120 min

BRANCH: CSE

Max. 40 Marks

Instructions: Answer any four questions of the following 4X10=40 Marks

The Question Paper Consists of 8 questions. Answer any 4 questions

Each Question Carries 10 Marks and may have 'A', 'B' as two sub-questions

Note (if any): Usage of any data/ Scientific calculator/code book may be permitted/not permitted.

1. Convert D flip flop to JK flip flop and T flip flop.
2. What is race around condition in JK flip flop, explain about master slave flip flop.
3. Design a MOD-12 asynchronous counter, draw neat logic diagram and timing diagram.
4. Design a MOD-10 synchronous counter, draw neat logic diagram and timing diagram.
5. Design a MOD-16 up/down counter, draw neat logic diagram and timing diagram.
6. Design a counter using D flip flops to count odd numbers only from 0 to 16 (1,3,5,7,9,11,13,15) .
7. compare mealy state machine and Moore state machine, write a FSM and get circuit to detect three or more 0's in serial input bit stream.
8. Convert SR flip flop to JK, D and T flip flops .



Rajiv Gandhi University of Knowledge Technologies,
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E2 (2017 BATCH) SEM1 MID1 EXAMINATIONS, July 2021

SUBJECT: Digital Logic Design

DATE: 25-07-2021(AN)

Time : 120 min

BRANCH: CSE

Max. 40 Marks

Instructions: Answer any four questions of the following 4X10=40 Marks

The Question Paper Consists of 8 questions. Answer any 4 questions

Each Question Carries 10 Marks and may have 'A', 'B' as two sub-questions

Note (if any): Usage of any data/ Scientific calculator/code book may be permitted/not permitted.

1. Convert the following number systems

$$\begin{array}{l} \text{i)} (236.2)_{10} \longrightarrow (\quad)_2 \\ \text{ii)} (532)_8 \longrightarrow (\quad)_{10} \\ \text{iii)} (4AE)_{16} \longrightarrow (\quad)_8 \\ \text{iv)} (563.3)_{10} \longrightarrow (\quad)_{16} \\ \text{v)} (101101.101)_2 \longrightarrow (\quad)_{10} \end{array}$$

2. i) Given two binary numbers $X = 1101001$ and $Y = 1001101$,

perform the subtraction **(a)** $X - Y$ and **(b)** $Y - X$ by using 2's complement method

ii) Subtract $361.4 - 413.8$ using BCD 10's complement method

3. i) Design all logic gates by using only NAND gates

ii) Design a Half Adder by using only NAND gates.

4. i) Design a 4 bit parallel adder/subtractor

ii) Perform operation $1000 - 0111$ using 4 bit parallel adder/subtractor circuit

5. i) Simplify $F(A, B, C, D) = \sum m(0, 2, 4, 9, 12, 15) + d(1, 5, 7, 10)$ by using K-Map

ii) Reduce the given expression using K-map

$$F = \prod M(1, 3, 4, 8, 9, 11, 15). d(0, 10, 12, 13, 14)$$

6. i) Simplify $F(A, B, C, D) = \sum m(0, 2, 5, 7, 8, 10, 13, 15)$ by using K-Map
 - ii) Simplify $F(A, B, C, D) = \sum m(0, 2, 5, 7, 8, 10, 13, 15)$ by using Boolean algebra and draw the logic circuit after minimization.
7. Design a 3x8 decoder and implement full adder by using 3x8 decoder and logic gates
8. Design a 8x1 MUX and implement $F = \sum m(0, 1, 2, 3, 4, 10, 11, 14, 15)$ using 8x1 MUX

**PART-A****Instructions:** Choose the correct choice of the following**18X1=18Marks**

1. $(AB)_{16} = (\underline{\quad})_{10}$
a) 170 b) 171 c) 172 d) 173
2. $10111-11001 =$
a)-1 b) 1 c) -10 d) 10
3. Excess-3 code for $(56)_{10}$ is –
a) 01010110 b) 10001001 c) 00111000 d) None
4. ASCII Code for “9” is –
a) 11111 b) 11110 c) 111000 d) None
5. Commutative law is –
a) $A+B=B+A$ b) $A+(B+C)=(A+B)+C$ c) both d) None
6. $(x+y)(x+y') =$
a) 0 b) 1 c) x d) None
7. $xy+z =$
a) 0 b) 1 c) x d) None
8. $xy+xy' =$
a) 0 b) 1 c) x d) None
9. $F(A,B,C)=\pi(1,4,7)$, then F' is equal to –
a) $\Sigma(0,2,3,5,6)$ b) $\pi(0,2,3,5,6)$ c) both d) None
10. flipflops are --- triggered devices.
a) level b) edge c) both d) none
11. universal gate is --
a) AND b) OR c) EX-OR d) NAND
12. -- is NOR gate IC.
a) 7400 b) 7402 c) 7404 d) 7408
13. example for combinational circuit is –
a) mux b) counter c) register d) none
14. – number of 2-input NAND gates required for $F=A'B'+XY$
a) 3 b) 4 c) 5 d) 6
15. Decade counter is example for --
a) synchronous sequential circuit b) asynchronous sequential circuit c) buffer d) none
16. $AB+(AB)'+ABC(AB+C) =$
a) 0 b) 1 c) $B+C'$ d) A
17. for complement the input information --- flipflop used.
a) S-R b) D c) J-K d) None
18. for which the flipflop, output is same as input.
a) S-R b) D c) J-K d) None

PART-B

Answer any SIX questions of the following, Each question carries Seven Marks $6 \times 7 = 42$ M

1. Find the minterms of the given Boolean function,

$$F = XY'Z + X'Y'Z + W'XY + WX'Y + WXY.$$

2. Simplify the following SOP expression using 5 variable Karnaugh map:

$$F(A,B,C,D,E) = \sum m(0,2,8,10,11,13,16,18,24,26,29) + \sum d(5,6,9,14,21,22,30)$$

3. Design a BCD to Excess-3 code converter using NAND ?

4. Design a 2-bit magnitude comparator?

5. Design a 4 by 2 priority encoder?

6. Implement the Boolean function using multiplexer F (A, B, C, D)

$$= \sum(1,3,4,11,12,13,14,15)$$

7. Draw circuit diagram, write the truth table & excitation table for S-R Flipflop?

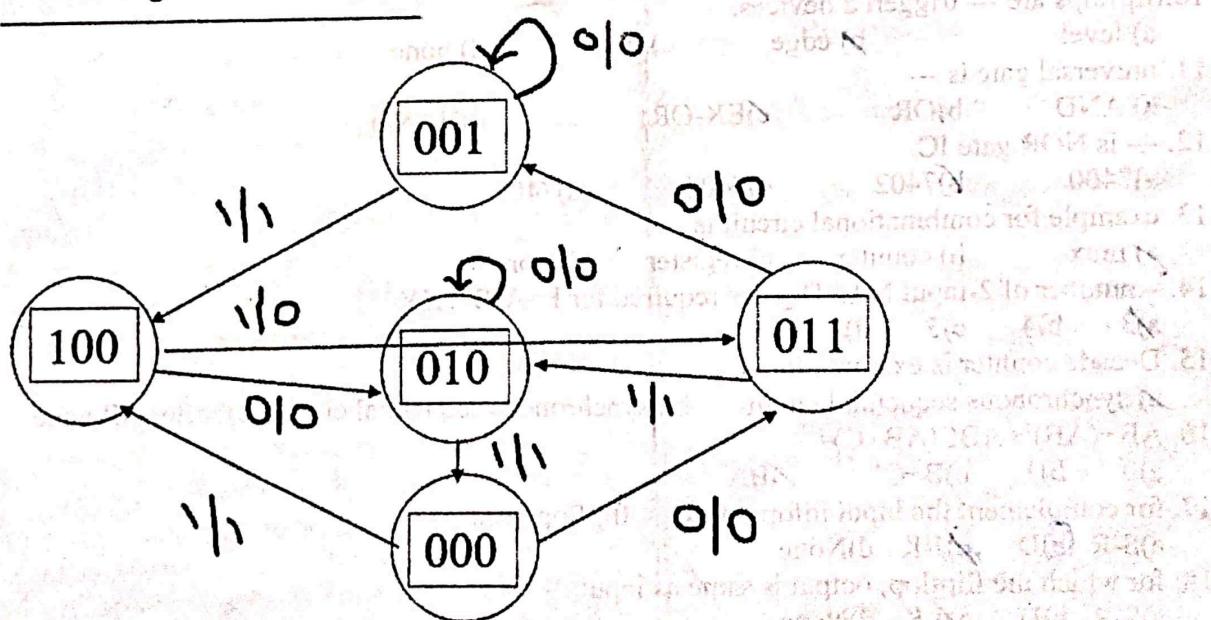
8. Design a 4 bit bi directional shift register?

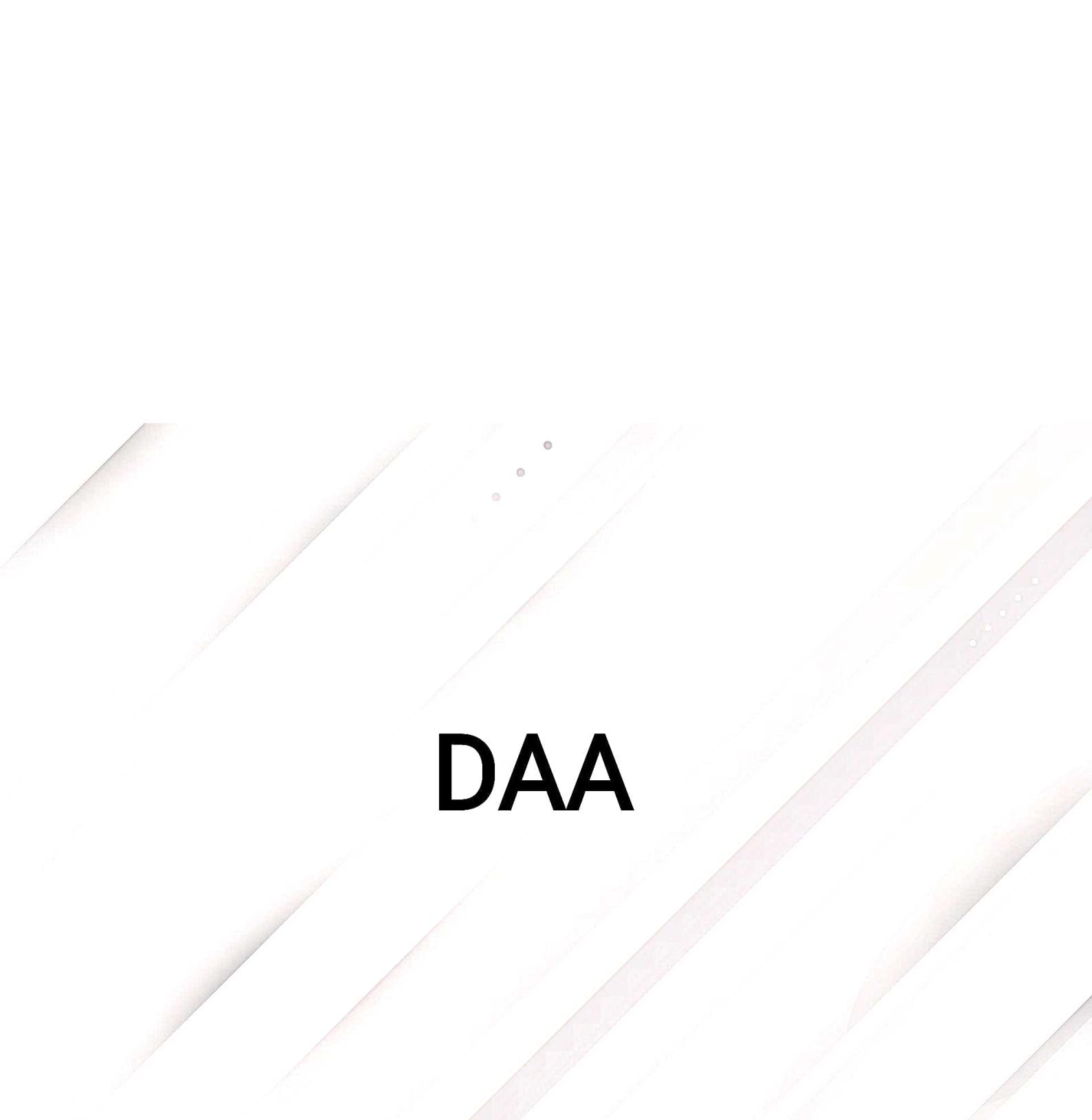
9. Design a 3 bit binary asynchronous counter?

10. Design a Decade counter?

11. Design a Bi directional Counter?

12. Design a clocked sequential circuit using D-flipflops





DAA



Rajiv Gandhi University of Knowledge Technologies,
Ongole Campus

E2 (2017 BATCH) SEM1 MID1 EXAMINATIONS, July 2021
SUBJECT: Design Analysis of algorithms DATE: 24-07-2021(FN)
Time : 120 min BRANCH: CSE Max. 40 Marks

Instructions: Answer any four questions of the following

4X10=40 Marks

1. A) Define the following terms ? 5M
 - i. Time complexity
 - ii. Space complexity
 - iii. Stability
 - iv. Theta notation
 - v. Big oh notation

- B) Explain Master theorem of all cases with an example 5M

2. A) Write notes on Asymptotic notation with function graphs 6M
 B) Write the following functions in increasing order 4M
 $n^{\log n}$, $n \log n$, n^n , $\log n^{1/2}$

3. A) Solve the recurrence relation using **Back Substitution** method 5M

$$T(n) = \begin{cases} 1 & n=0 \\ T(n-1)+\log n & n>0 \end{cases}$$

 B) Solve Merge sort Time complexity using **Recursive Tree** method 5M

4. Explain Starssen's matrix algorithm and apply it on the following example & verify using Naïve matrix multiplication 10M

$$\begin{pmatrix} 5 & 2 & 6 & 1 \\ 0 & 6 & 2 & 0 \\ 3 & 8 & 1 & 4 \\ 1 & 8 & 5 & 6 \end{pmatrix} \times \begin{pmatrix} 7 & 5 & 8 & 0 \\ 1 & 8 & 2 & 6 \\ 9 & 4 & 3 & 8 \\ 5 & 3 & 7 & 9 \end{pmatrix}$$

5. A) Solve the following optimization problem using 0/1 knap sack method The capacity of bag weight is:5kg 7M

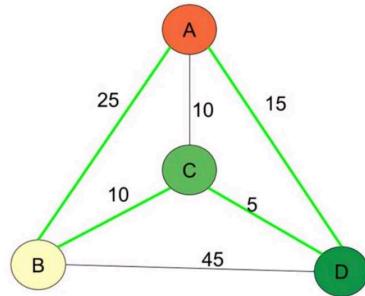
Item #	Weight (Kg)	Value (Rs.)
1	2	3
2	3	4
3	4	5
4	5	6

 B) Write a short notes on Optimal Binary Search tree 3M

6. Solve the Matrix chain multiplication using dynamic programming 10M

Matrix	A	B	C	D	E
dimension	4x3	3x8	8x6	6x4	4x2

7. Solve the travelling sales man Problem using dynamic programming & do the analysis 10M



8. Solve the reliability issue using dynamic programming Cost budget is: Rs: 110/- 10M

S.no	Copies	Reliability	cost
D1	2	0.56	32
D2	1	0.62	28
D3	3	0.6	36



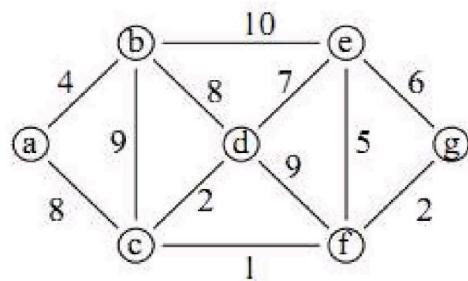
Rajiv Gandhi University of Knowledge Technologies,
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E2 (2017 BATCH) SEM1 MID2 EXAMINATIONS, August 2021
SUBJECT: Design Analysis of algorithms DATE: 07-08-2021(FN)
Time : 120 min BRANCH: CSE Max. 40 Marks

Instructions: Answer any four questions of the following

4X10=40 Mar.

1. Explain minimum spanning tree algorithm? Apply prim's and kruskal's algorithm for the following graph? 10M



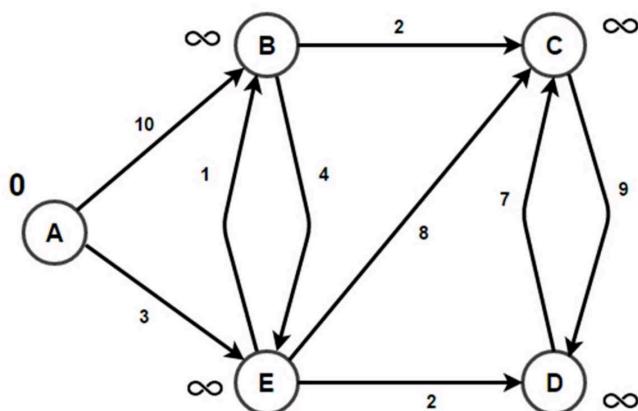
2. A) Explain the following terms with an example?

- i. Articulation point
- ii. Bi connected component
- iii. find-union data structure

6M

- B) List out the differences between BFS and DFS traversals? 4M

3. Write single source shortest path algorithm and apply dijskstra algorithm on the following graph? 10M



4. A) solve n queen problem using backtracking method(take 4X4)? 5M

- B) Solve the following sum of subset problem using backtracking method?

Set= {2,4,6,8} sum: 10

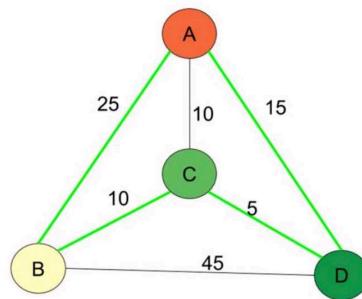
5M

5. A) Solve the following optimization problem using 0/1 knap sack using branch and bound LC method The capacity of bag weight is:5kg 5M

Item #	Weight (Kg)	Value (Rs.)
1	2	3
2	3	4
3	4	5
4	5	6

- B) Write a short note on Line segment properties and Line segment algorithms used in Computational geometry? 5M

6. Solve the travelling sales man Problem using Branch and bound technique and do the analysis? 10M



7. A) Explain Naïve String matching algorithm with an example? 5M
 B) Explain the Rabin karp string matching algorithm? 5M
8. Write a notes on class of complexities and reducibility? 10M

**PART-A****18X1=18Marks****Instructions: Choose the correct choice of the following****1. Select the True statements?**

- I. Worst case: The maximum number of steps taken on any instance of size n
- II. Best case: The minimum number of steps taken on any instance of size n
- III. Amortized case: A sequence of operations applied to the input of size n averaged over time
 - a) only I
 - b) only II
 - c) I and II
 - d) all the above
 - e) None of them

2. Find time complexity for the following code snippet _____

```
for(i=1;i<=n;i++)
    for(j=1;j<=n;j=j+i)
```

```
    printf("hi");
```

- a) $O(n\log n)$
- b) $O(n^2)$
- c) $O(n^3)$
- d) $O(n)$
- e) None

3. Time complexity for the recurrence relation is $T(n)=3T(n/4)+n\log n$

- a) $O(n^2)$
- b) $O(n\log n)$
- c) $O(n\log\log n)$
- d) $O(n^{\log n})$
- e) None

4. Strassen's matrix multiplication algorithm will take time to multiply two matrices?

- a) $O(n^2)$
- b) $O(n^3)$
- c) $O(n^{2.89})$
- d) $O(n\log n)$
- e) None

5. Which of the following Statements are True?

- I. Every recursive algorithm can be converted into iterative algorithm
- II. Master theorem can be used to solve iterative algorithms
- III. Increasing order of functions: $1 < \log n < \sqrt{n} < n \log n < n^2 < n^3 < \dots < 2^n < 3^n < \dots < n^n$
 - a) only I
 - b) I&II
 - c) I&III
 - d) all the above
 - e) None

6. worst case time complexity of merge sort and quick sort are _____

- a) $O(n\log n), O(n^2)$
- b) $O(n^2), O(n^2)$
- c) $O(n\log n), O(n\log n)$
- d) $O(n^2), O(\log n)$
- e) None

7. Which of the following statements are false?

- I. Weighted union: If the no. of nodes in the tree with root x, is less than the no. of nodes in the tree with root y, then make x as parent.
- II. Weighted union: If the no. of nodes in the tree with root x, is less than the no. of nodes in the tree with root y, then make y as parent.
- III. Weighted union: If the no. of nodes in the tree with root x, is less than the no. of nodes in the tree with root y, then make a new node z as parent.
 - a) only III
 - b) I & II
 - c) II & III
 - d) I & III
 - e) None

8. Which of the following Statements are True _____

- I. If a graph is said to be bi-connected if and only if there exists at least one articulation point in the graph.
- II. If a graph is said to be bi-connected if and only if there exist no articulation point in the graph.
- III. If a graph is said to be connected there exist a path between every two vertices
 - a) only I & III
 - b) only II & III
 - c) only I
 - d) all the above
 - e) None

9. Which of the following is not a property of Dynamic programming

- a) Memoization
- b) Overlapping of sub problems
- c) Optimal substructure
- d) Local optimal
- e) None

10. Given five process apply job sequence algorithm to maximize profit?

Job id	J1	J2	J3	J4
Deadline	4	1	1	1
Profit	20	10	40	30

- a) J3 → J1 b) J1 → J3 c) J3 → J1 → J4 d) J4 → J1 e) None

11. Which of the following Statements are true about spanning tree _____

- I. Removing one edge from the spanning tree will make it as disconnected graph
- II. From a complete graph by removing $\max(e-n+1)$ edges we can construct spanning tree
- III. If the graph is complete K_n , then n.of possible spanning tree n^{n-2} .

- a) only I&III b) only II & III c) only I & II d) all the above e) None

12. Which of the given options provides the increasing order of asymptotic complexity of functions f_1, f_2, f_3 and f_4 ? $f_1(n)=2^n$, $f_2(n)=n^{(3/2)}$, $f_3(n)=n\log n$, $f_4(n)=n^{\log n}$

- a) f_3, f_2, f_4, f_1 b) f_3, f_2, f_1, f_4 c) f_2, f_3, f_1, f_4 d) f_2, f_3, f_1, f_4 e) None

13. The smallest number of colors needed to color a graph G is called its _____.

- a) Chromatic number b) Graph number c) Vertex filling d) Optimal number e) None

14. A person wants to visit some places. He starts from a vertex and then wants to visit every vertex till it finishes from one vertex, backtracks and then explore other vertex from same vertex. What algorithm he should use?

- a) Depth First Search b) Breadth First Search
c) Prim's algorithm d) Kruskal's Algorithm e) None

15. What approach is being followed in Floyd Warshall's Algorithm?

- a) Greedy technique b) Dynamic Programming
c) Linear Programming d) Backtracking e) None

16. N queen puzzle solution set where N is 4 _____

- a) {3,1,4,2}{1,2,3,4} b) {1,4,3,2}{3,1,4,2} c) {2,1,4,3}{4,3,2,1} d) {1,3,4,2}{2,1,4,3} e) None

17. Which of the following Statements are true

- I. If a problem is said to solvable if and only if there must exist an algorithm.
- II. If a problem is said to solvable if there exist an algorithm or if there is any proof that we can't solve the problem
- III. All NP class problems are exponential time complexity

- a) only I & II b) only II & III c) only III, II d) all of the above e) None

18. If we have an edge between vertices u and v (from u to v), $\text{dist}[u]$ represents the distance is representation

i.e edge relaxation step _____

- a) If $\text{dist}[u] + \text{weight} < \text{dist}[v]$, then
 $\text{dist}[v] = \text{dist}[u] + \text{weight}$
b) If $\text{dist}[u] + \text{weight} > \text{dist}[v]$, then
 $\text{dist}[v] = \text{dist}[u] + \text{weight}$
- c) If $\text{dist}[v] + \text{weight} > \text{dist}[u]$, then
 $\text{dist}[u] = \text{dist}[v] + \text{weight}$
d) If $\text{dist}[v] + \text{weight} < \text{dist}[u]$, then
 $\text{dist}[u] = \text{dist}[v] + \text{weight}$
e) None

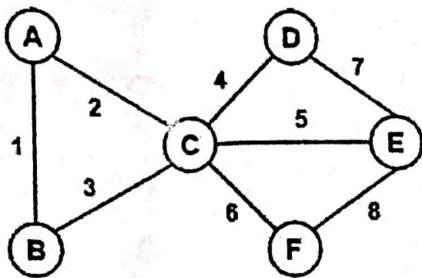
PART-B

Answer any SIX questions of the following, Each question carries Seven Marks

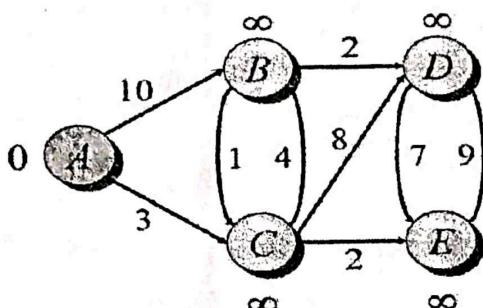
6X7=42 M

1. What do you understand the term Design & analysis of algorithms? Explain asymptotic notations of Time complexities? (2+5)M
2. Explain Master's theorem? Solve Recurrence relation using master theorem?
 $T(n)=2T(n/4)+n\log n$ (5+2)M
3. What is Divide & conquer paradigm? Design algorithm for Quick sort using Divide conquer Strategy and do analysis? (2+3+2)M

4. Write a notes on Disjoint set operations with algorithms? 7M
 5. Write differences between prim's and kruskal's algorithm? Apply Prim's algorithm to find minimum spanning tree and cost on source node A? (4+3)M



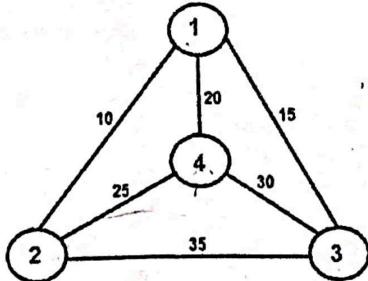
6. What is Greedy method? Apply Greedy method to solve Single source shortest path algorithm on given graph, source node as A? 7M



7. A Thief enters a house for robbing it. He can carry a minimal weight of 5 kg into his bag. There are four items in the house with the following weight and value. What items should thief take ? He either takes item or leave item?(Note: use dynamic programming) 7M

Item	Weight	Value
Mirror	2kg	\$3
Silver nugget	3kg	\$4
Vase	4kg	\$5
Radio	5kg	\$6

8. Design a three stage system with device type D1,D2 and D3. The costs are 30,15,20 respectively. The cost of the system is to be no more than 105. The reliability of each device is 0.9,0.8 and 0.5 respectively. 7M
 9. What is back tracking? State N Queen's problem Solve 4 Queen's problem using back tracking method? 7M
 10. Solve Travelling Salesman problem using branch and bound technique on source node? 7M



11. Explain the terms Solvable,Decidable? Define p,np,np-hard,npcomplete classes with examples and neat venn diagram? (2+5)M
 12. List out various String Matching algorithms? Explain Rabinkarp's string matching algorithm with an example? 7M

PS



**RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES
ONGOLE CAMPUS**

E2(2018 BATCH) SEM1 END SEMESTER EXAMINATIONS, APRIL 2022

SUBJECT: Probability & Statistics

Time : 180 min

DATE: 11-04-2022

BRANCH: CSE

Max. 60 Marks

PART-A

Instructions: Choose the correct choice

18X1=18Marks

1. The number of circular permutations taken all at a time is []
a) $n!$ b) $(n-1)!$ c) $(n-2)!$ d) $(n-2)!$
2. Probability of Empty set is []
a) 0 b) 1 c) 2 d) 3
3. Probability of any event lies between []
a) 3 & 4 b) 2 & 1 c) 1 & 0 d) non of these
4. Discrete Probability represents data []
a) count data b) measured data c) count & measured data d) none of these
5. Variance of constant value is []
a) 3 b) 2 c) 1 d) 0
6. Cauchy – Schwartz Inequality for the two random variables X and Y is..... []
a) $E((X+Y)^2) = E(X^2)+E(Y^2)$ b) $E((XY)^2) = E(X^2) E(Y^2)$ c) $E((XY)^2) \leq E(X^2)E(Y^2)$
d) None of these
7. If 'X' is a discrete random variable with p.m.f $P(X)$,then $\phi_X(t) = \dots$ []
a) $\sum_x e^{itx} p(x)$ b) $\sum_x e^{itx} f(x)$ c) $\int e^{itx} f(x) dx$ d) None of these.
8. If X is a random variable ,then $K_X(t) = \dots$ []
a) $\sum_x e^{tx} p(x)$ b) $\sum_x e^{tx} f(x)$ c) $\int e^{tx} f(x) dx$ d) $\ln(\phi_X(t))$.
9. If X is a random variable with p.m.f $p(x)$,then $G_X(t) = \dots$ []
a) $\int_{x=0}^{\infty} t^x p(x)$ b) $\sum_x e^{tx} p(x)$ c) $\sum_x t^x f(x)$ d) $\int e^{tx} f(x) dx$.
10. The ordered values $X_{(1)}, X_{(2)}, \dots, X_{(n)}$ are known as of n random variables []
a) Original Statistics b) Orient Statistics c) O-man Statistics d) Order Statistics.
11. WLLN deals withinvolving \bar{X}_n []
a) limits of proportions b) limits of postulations c) limits of probabilities d) none of these .
12. SLLN means []
a) Stone law of large numbers b) Strange law of large numbers c) Strong law of large numbers d) none of these.
13. A group of individuals under study is called []
a) Population b) Sample c) Sample space d) None of these
14. Number of alphabets in English is an example of []
a) Finite population b) Infinite population c) Order Statistics d) None of these
15. If size of the sample is greater than 30,then the Sample is called []
a) Weak Sample b) Strong sample c) Large sample d) Small sample
16. The t-distribution is also known as []
a) Students t- distribution b) Parents t- distribution c) friends t-distribution d) None of these
17. Chi-Square distribution is used to calculate []
a) Dependent of the attributes b) Independent of the attributes c) Dependent & Independent of the attributes d) None of these.
18. Impossible event is denoted by []
a) A b) B c) C d) \emptyset .

PART-B

6X7=42 M

Answer any SIX questions of the following

1. Find the number of 4 letters word that can be formed using the letters of the word **MIXTURE** which (i) How many of these words begin with E (ii) How many of these contain "X".
2. In a class of 75 students, 15 were considered to be very intelligent, 45 as medium and the rest of them are below average. The probability that a very intelligent student fails in a viva – voice examination is 0.005; the medium student failing has a probability 0.05; and the corresponding probability for a below average student is 0.15. If a student is known to have passed the viva – voice examination, what is the probability that he is below average?
3. The j.p.m.f of (X, Y) is given by $p(X, Y) = \begin{cases} k(2x + y), & \text{for } x = 1, 2; y = 1, 2 \\ 0, & \text{Otherwise} \end{cases}$, where k constant
(a) Find the value of k (b) find marginal and conditional p.m.fs.
4. The mean and variance of Binomial Distribution are 4 and $4/3$ respectively. Find the value of $P(X \geq 1)$.
5. If a random variable X has mean 12 and variance 9 and the probability distribution is unknown then find $P(6 < X < 18)$.
6. Find the m.g.f of geometric distribution $G(P)$ and hence obtain its mean and variance.
7. Find the conditional probability of density function of $x_{(i)}$ given $x_{(j)}$ for $1 \leq i < j \leq n$.
8. Let $\{X_k\}$ be a sequence of independent r.vs such that $P(X_k = \pm 1) = \frac{1}{2}(1 - 2^{-n})$.
 $P(X_k = \pm 2^{-n}) = 2^{-n-1}$. Does the SLLN hold for the sequence?
9. A population consists of numbers 2, 3, 6, 8 and 11. Consider all possible samples of size 2 that can be drawn with replacement from this population. Find a) Mean of Population b) S.D of Population c) Mean of the sampling Distribution of means d) S.D of Sampling Distribution of means.
10. A Random sample of size 100 is taken from infinite population having the mean 76 and variance 25.6. What is the probability that \bar{x} will be between 75 & 78.
11. Define t-distribution, Z-distribution and its applications.
12. Define Chi-Square distribution and its applications.

* * *