

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: CS309**Course Name: GRAPH THEORY AND COMBINATORICS**

Max. Marks: 100

Duration: 3 Hours

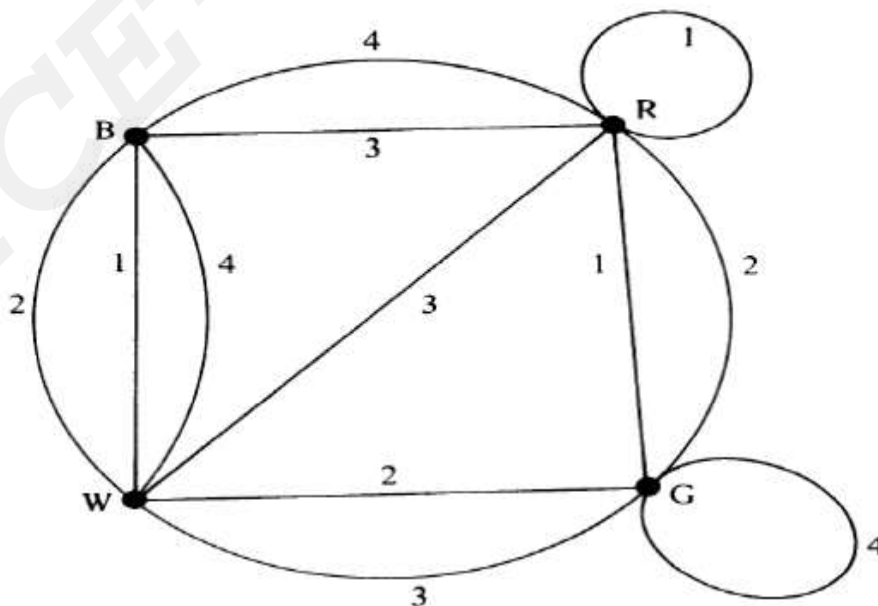
PART A*Answer all questions, each carries 3 marks.*

Marks

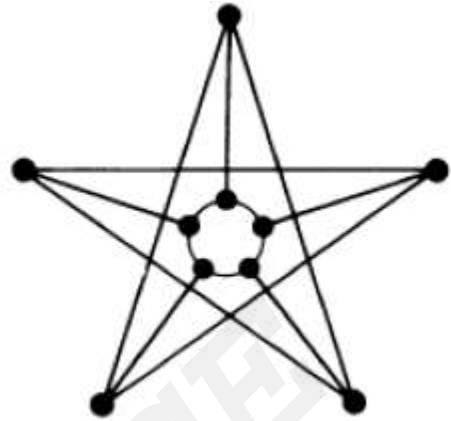
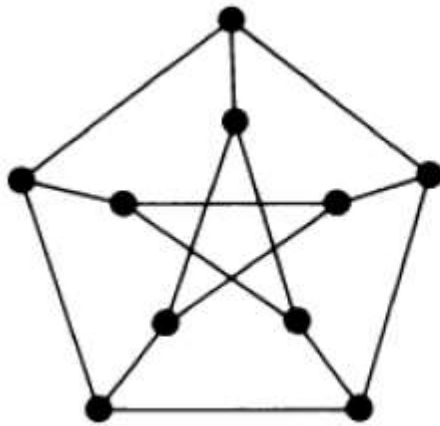
- | | | |
|---|--|-----|
| 1 | Define pendent vertex, isolated vertex and null graph with an example. | (3) |
| 2 | Show that in a simple graph with n vertices, the maximum number of edges is $n(n-1)/2$ | (3) |
| 3 | Define Hamiltonian circuits and path with examples. Find out the number of edge disjoint Hamiltonian circuits possible in a complete graph with five vertices. | (3) |
| 4 | State and prove Dirac's Theorem of Hamiltonicity. | (3) |

PART B*Answer any two full questions, each carries 9 marks.*

- | | | |
|---|---|-----|
| 5 | a) Define subgraphs. What are edge disjoint and vertex disjoint subgraphs? Construct two edge disjoint subgraphs of the graph G . | (4) |
|---|---|-----|



- b) Check whether the two graphs are isomorphic or not. Justify your answer. (5)

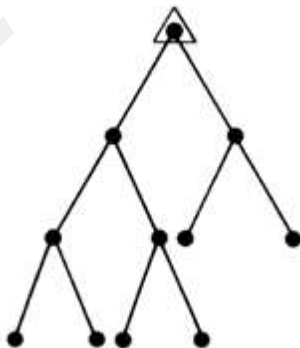


- 6 a) Prove that in a complete graph with n vertices there are $(n-1)/2$ edge disjoint Hamiltonian circuits, if n is an odd number ≥ 3 (5)
- b) Explain arbitrarily traceable graphs with suitable examples. (4)
- 7 a) Is it possible to have simple graphs with the following degree sequences?if yes, draw the graphs (5)
- 2,3,3,3,3,3,4,5
 - 1,3,3,4,5,6,6
 - 1,2,3,3,4,5,6
- b) Explain digraphs and binary relation on digraphs. (4)

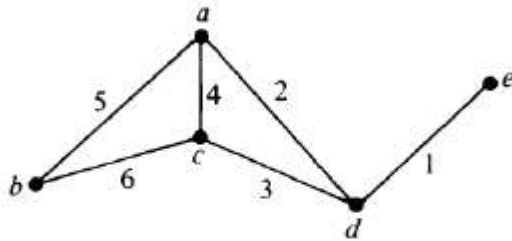
PART C

Answer all questions, each carries 3 marks.

- 8 Prove that in a graph G , if there is exactly one path between every pair of vertices, then G is a tree. (3)
- 9 Define rooted binary tree. Find the path length of the following tree (3)



- 10 Sketch all spanning trees of the given graph (3)

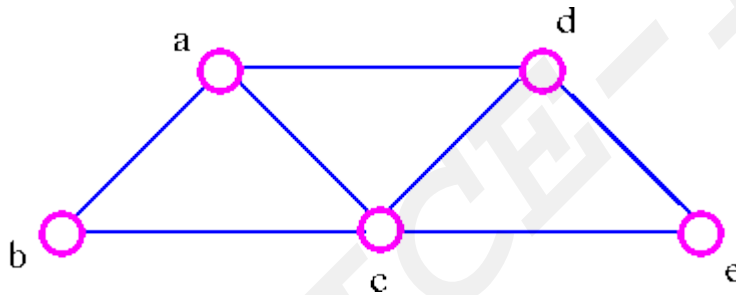


- 11 Draw the two simplest non planar graphs and also mention their properties. (3)

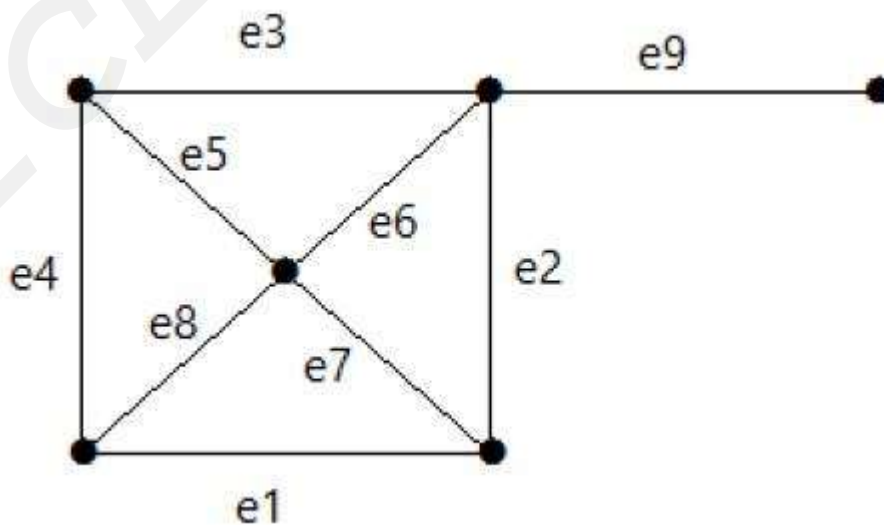
PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Define Spanning tree. Find any two spanning trees T_1 , T_2 of the graph G given below. Also find the branch set, chord set, rank and nullity. (6)

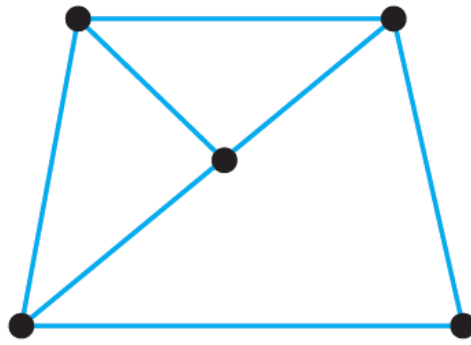


- b) Sketch two different binary trees on 13 vertices, one having maximum height and other having minimum height. (3)
- 13 a) Define Cut set. Find all cutsets of the graph G given below and also find the edge connectivity of G . (6)



- b) Define vertex connectivity and draw a graph with an articulation point. (3)

- 14 a) Draw the geometric dual of the graph G given below. (4)

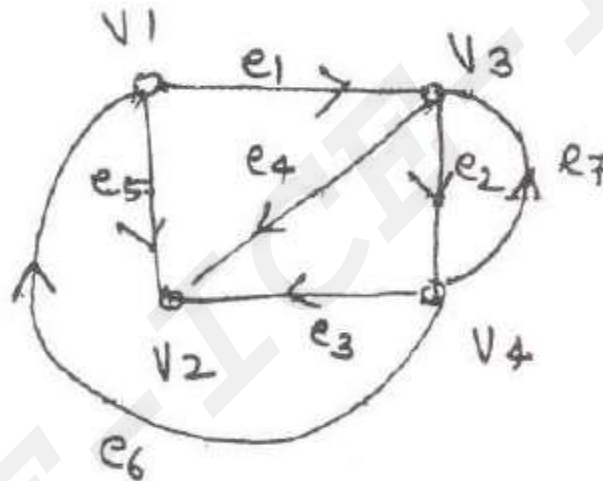


- b) Prove that a connected planar graph with n vertices and e edges has $e-n+2$ regions. (5)

PART E

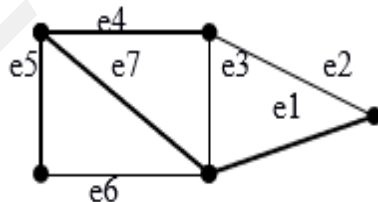
Answer any four full questions, each carries 10 marks.

- 15 a) Give the incidence matrix of the graph G . Also write the properties of incidence matrix. (6)



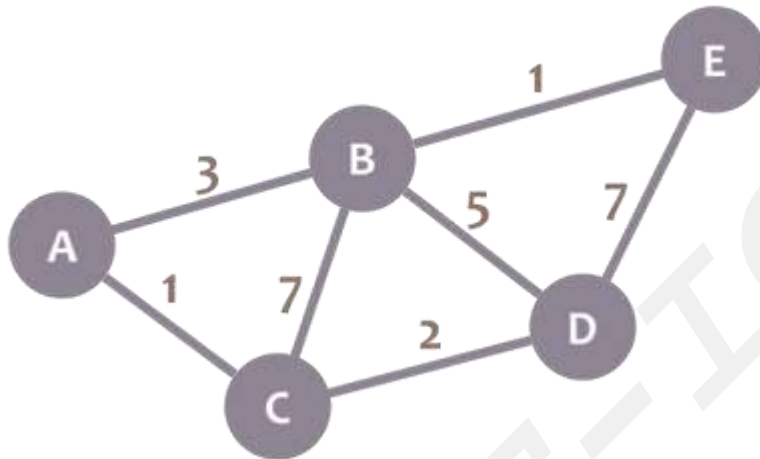
matrix.

- b) Prove that the rank of the incidence matrix of a connected graph G is $n-1$. (4)
- 16 a) Find the Fundamental Circuit matrix of the give graph G with respect to the spanning tree shown in heavy lines. Also find its rank. (6)



- b) Prove that "If B is a circuit matrix of a connected graph G with e edges and n vertices then $\text{rank of } B = e - n + 1$ " (4)
- 17 a) Explain different methods used in computer representation of graphs with an example. (5)
- b) Draw the flow chart to determine connectedness and components of a graph. (5)

- 18 a) Draw a flowchart indicating all the five conditions to find the spanning tree /spanning forest. Apply it to find the spanning tree /spanning forest for any disconnected graph of your choice. (10)
- 19 a) Write Dijkstra's Shortest path algorithm and apply this algorithm to find the shortest path (10)



- 20 a) Discuss an algorithm to find the minimum spanning tree of a graph G with an example (10)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CS301

Course Name: THEORY OF COMPUTATION (CS)

Max. Marks: 100

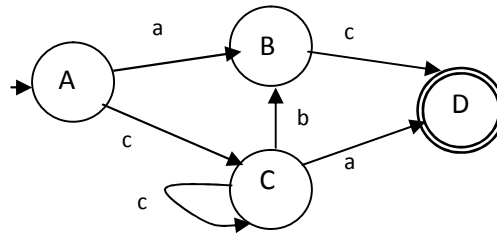
Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 What is the regular expression for the DFA (3)

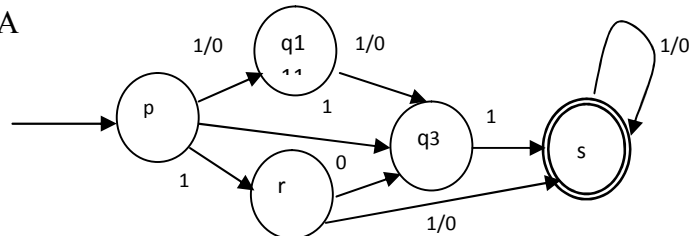


- 2 Compare the transition functions of NFA and DFA. (3)
- 3 Explain in English language the language accepted by the DFA in Question 1. (3)
- 4 What is a Moore machine? How is it different from mealy machine? (3)

PART B

Answer any two full questions, each carries 9 marks.

- 5 a) Convert the NFA to DFA (4.5)



- b) Prove the equivalence of regular expression and Finite state automata. (4.5)
- 6 a) Prove the equivalence of NFA and ϵ -NFA. (4.5)
- b) Draw a six state DFA which can be minimized to a three state DFA where set of input symbols is $\{a, b, c\}$. Draw both the DFAs. Assume whatever is required. (4.5)
- 7 a) Prove the equivalence of NFA and DFA. (4.5)
- b) What is Myhill Nerode Theorem? (4.5)

PART C

Answer all questions, each carries 3 marks.

- 8 What is a derivation tree? (3)

- 9 Is the grammar $\{E \rightarrow E+E | E-E | \text{id}\}$ ambiguous? Why? (3)
- 10 What is the difference between NPDA and DPDA? (3)
- 11 Is the language ww^R where w is string of zeroes and ones, accepted by DPDA? (3)
Why?

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Show that $L = \{0^p \mid p \text{ is a prime number}\}$ is not regular. (4.5)
- b) Construct the CFG for the union of the languages $0^n 1^n$ and $a^n b^n$ for $n > 0$. (4.5)
- 13 a) Convert the grammar $\{S \rightarrow AaCb \mid ABa, A \rightarrow bAa \mid a, B \rightarrow BaB \mid b, C \rightarrow c\}$ to (4.5)
Chomsky normal form.
- b) Construct the PDA for the language $\{0^n 1^n\}^*$. (4.5)
- 14 a) Give the formal definition of an NPDA. (3)
- b) Show that NPDA and CFG are equivalent. (6)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Consider $L = \{ww \mid w \in \{0, 1\}^*\}$. Prove L is not a CFL. (5)
- b) Explain Chomsky hierarchy and corresponding type0, type1, type2 and type 3 (5)
formalism.
- 16 a) Design a Turing machine that determines whether the binary input string is of (5)
odd parity or not
- b) How does the Universal Turing machine simulate other Turing machines? (5)
- 17 a) Design a Turing machine that accepts $a^n b^m$ where $n > 0$ and $m > n$. (5)
- b) Explain why Halting problem is unsolvable problem. (5)
- 18 a) What is the instantaneous description for a Turing machine? Explain with an (5)
example.
- b) Show that normal single tape Turing machine can perform computations (5)
performed by multi-tape Turing machine (informal explanation is sufficient).
- 19 a) What is a recursive language? Give an example. (5)
- b) How does a Turing machine differ from PDA and FSA? (5)
- 20 a) State pumping lemma for CFL. Mention one application of Pumping lemma (5)
- b) What is a non-deterministic Turing machine? (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CS301

Course Name: THEORY OF COMPUTATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

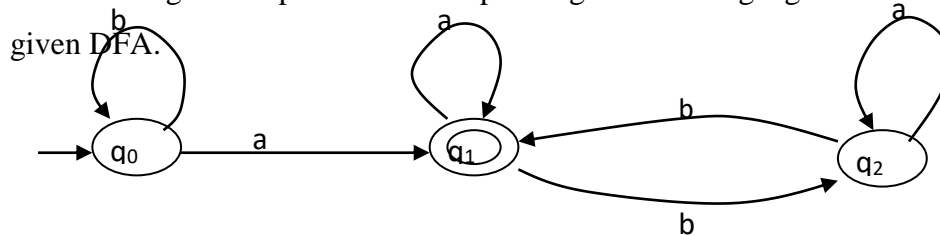
Marks

- | | | |
|---|---|-----|
| 1 | What is a Finite state automata? | (3) |
| 2 | Construct DFA for the language 101^* | (3) |
| 3 | Give the regular expression for the language: strings of 'a' and 'b' containing at least two 'b'. | (3) |
| 4 | What is a two-way finite automata? | (3) |

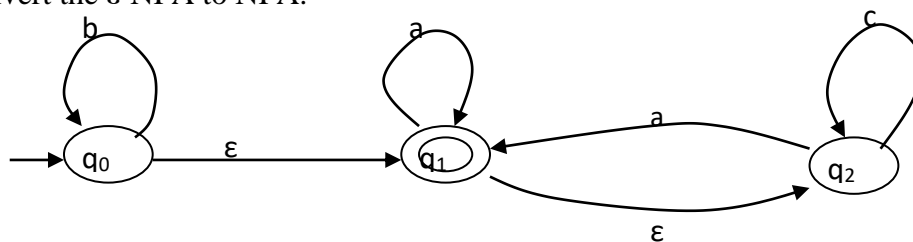
PART B

Answer any two full questions, each carries 9 marks.

- 5 a) Find the regular expression corresponding to the language of the given DFA. (4.5)

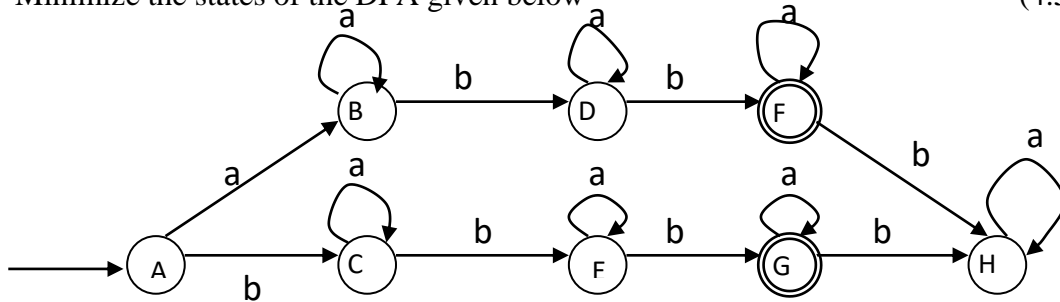


- b) Prove the equivalence of NFA and ϵ -NFA. (4.5)
- 6 a) Convert the ϵ -NFA to NFA. (4.5)



- b) Prove the equivalence of regular expression and finite state automata (4.5)
- 7 a) Compare the transition functions of DFA, NFA and ϵ -NFA. (4.5)

- b) Minimize the states of the DFA given below (4.5)



PART C

Answer all questions, each carries 3 marks.

- 8 Give the CFG for the language ww^R where w is string of zeroes and ones. (3)
- 9 What is a derivation tree? Give an example. (3)
- 10 Compare DPDA and NPDA. (3)
- 11 Explain any two closure properties of CFL. (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Prove that the language 1^n0^n is non-regular where $n > 0$. (4.5)
- b) Construct PDA for the language wcw^R where w is string of zeroes and ones. (4.5)
- 13 a) Prove the equivalence of PDA accepting by empty stack and final states (4.5)
- b) Convert the grammar $\{S \rightarrow ABaC | ABa, A \rightarrow Aa | a, B \rightarrow BaB | b, C \rightarrow CC\}$ to Chomsky normal form. (4.5)
- 14 a) Convert to Greibach Normal form. $\{S \rightarrow AB, A \rightarrow SA | AA | a, B \rightarrow SB | b\}$ (4.5)
- b) Prove the equivalence of CFG and PDA. (4.5)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Prove that $a^n b^n c^n$ is non-context free language where $n > 0$. (5)
- b) What is a Universal Turing Machine? (5)
- 16 a) What is Pumping lemma for CFL? (5)
- b) What is Halting problem? (5)
- 17 a) What is Linear Bounded Automata? (5)
- b) What is Chomsky hierarchy? Give example for each type. (5)
- 18 a) Give the context sensitive grammar for the language $a^n b^n c^n$ where (5)

$n > 0$.

- b) What is Multi-tape Turing Machine? (5)
- 19 a) Design a Turing machine that accepts the language $1^n 0^n$ where $n > 0$. (5)
- b) What is a non-deterministic Turing Machine? Give an example. (5)
- 20 a) What is a Turing machine? Give the specification of a Turing machine and explain. (5)
- b) What is recursive and recursively enumerable languages (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CS301

Course Name: THEORY OF COMPUTATION

Max. Marks: 100

Duration: 3 Hours

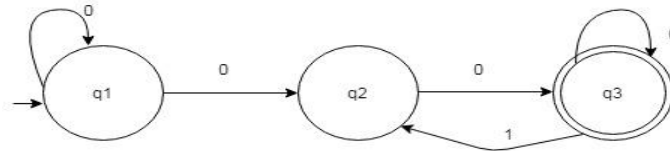
PART A

Answer all questions, each carries 3 marks.

Marks

- 1 Define nondeterministic finite automata(NFA). Draw the NFA for the language $L=\{a^n b^m \mid n, m \geq 1\}$ 3

- 2 Convert the following NFA to DFA. 3



- 3 Write regular expression for the language $L=\{1^n 0^m \mid n \geq 1, m \geq 0\}$ 3
- 4 Differentiate Moore machine from Mealy machine. Write the tuple representation for both machines. 3

PART B

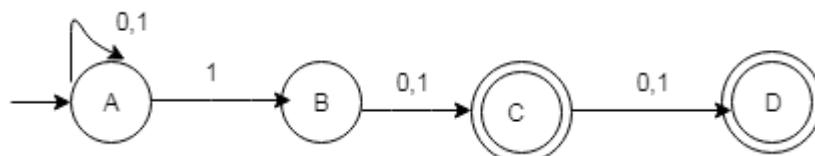
Answer any two full questions, each carries 9 marks.

- 5 a) Write the notation for the language defined by a DFA. Write a string belong to the language L^3 if $L=\{0,1\}$. 3
- b) Construct NFA without ϵ – transitions from the following NFA. $M=(\{q_0, q_1, q_2\}, \{a, b, c\}, \delta, q_0, \{q_2\})$ and $\delta(q_0, a) = \{q_0\}$, $\delta(q_0, b) = \{q_1\}$, $\delta(q_0, c) = \{q_2\}$, $\delta(q_1, \epsilon) = \{q_0\}$, $\delta(q_1, a) = \{q_1\}$, $\delta(q_1, b) = \{q_2\}$, $\delta(q_2, \epsilon) = \{q_1\}$, $\delta(q_2, a) = \{q_2\}$, $\delta(q_2, c) = \{q_0\}$. 6
- 6 a) State Myhill-Nerode Theorem. 3
- b) Minimize the following DFA. 6

δ	a	b
P0	P0	P1
P1	P2	P1
P2	P3	P1
*P3	P3	P4
*P4	P5	P4

*P5	P3	P4
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- 7 a) Construct regular expression corresponding to the following state diagram: 4.5



- b) Design an ϵ -NFA for the regular expression $(0+1)^*01$ 4.5

PART C

Answer all questions, each carries 3 marks.

- 8 Write the conditions for a pushdown automaton to be considered as deterministic. 3
- 9 Which are the methods to accept a string in a PDA? Whether both type of PDAs can define the same language. Justify your answer. 3
- 10 Convert the following grammar to Chomsky Normal Form. 3
- $S \rightarrow 0S0 \mid 1S1 \mid \epsilon$
- 11 Whether the following grammar is ambiguous? 3
- $E \rightarrow E+E \mid E * E \mid I$
- $I \rightarrow 0 \mid 1 \mid a \mid b$

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Verify that the following languages is not regular: 4.5
- $\{a^n b^{2n} \mid n > 0\}$
- b) Which of the following operations are closed under regular sets. Justify your answer. 4.5
- i) Complementation ii) Set difference iii) string reversal iv) Intersection
- 13 a) Give a CFG for the language $N(M)$ where $M = (\{p, q, r\}, \{0, 1\}, \{Z, X_0\}, \delta, q_0, Z, r)$ and δ is given by $\delta(p, \epsilon, X_0) = \{(q, ZX_0)\}$, $\delta(q, \epsilon, X_0) = \{(r, \epsilon)\}$, $\delta(q, 1, Z) = \{(q, ZZ)\}$, $\delta(q, 0, Z) = \{(q, \epsilon)\}$. 4.5
- b) Find the Greibach normal form grammar equivalent to the following CFG: 4.5
- $S \rightarrow AB$
- $A \rightarrow BS \mid 1$
- $B \rightarrow SA \mid 0$
- 14 a) Design a PDA to accept the language $\{0^{2n}1^n \mid n \geq 1\}$. 4.5
- b) Find a CFG without ϵ -productions equivalent to the grammar defined by 4.5
- $S \rightarrow ABaC, A \rightarrow BC, B \rightarrow b / \epsilon, C \rightarrow D / \epsilon, D \rightarrow d$

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) State Pumping lemma for CFLs. Write the applications of pumping lemma for CFL s. 4
- b) Check whether $L = \{a^i b^i c^i \mid i > 0\}$ belong to CFL or not. 6
- 16 a) Discuss about Multitape Turing Machines. Explain informally how they can 5

	simulate the moves of a Turing Machine	
	b) Write a note on Universal Turing machines.	5
17	a) How to identify deterministic Turing machine from nondeterministic TM	3
	b) Write notes on the following:	7
	i) decidable and undecidable problems	
	ii) Halting Problem of Turing machine.	
18	a) Write the properties of recursive languages and recursively enumerable languages.	3
	b) Write the Chomsky hierarchy of languages. Prepare a table indicating the automata and grammars for the languages in the Chomsky Hierarchy.	7
19	a) Define Turing machine [Write the tuple representation for TM].	5
	b) Design a Turing machine to identify the strings belong to the language $L = \{0^n 1^n \mid n > 0\}$.	5
20	Design the Turing machine to recognize the language: $\{0^n 1^n 0^n \mid n \geq 1\}$.	10

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: CS301**Course Name: THEORY OF COMPUTATION**

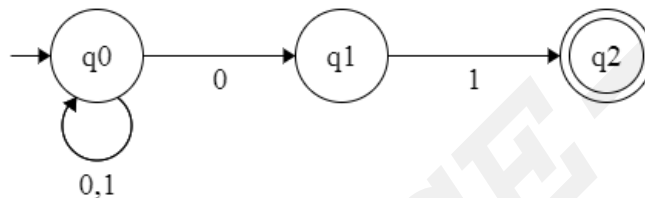
Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks.*

Marks

- 1 Formally define extended delta for an NFA. Show the processing of input $w = 0101$ for the following NFA. (3)



- 2 Differentiate between the transition function in DFA, NFA and ϵ -NFA (3)
- 3 Design a Moore machine to determine the residue of mod 2 of the input treated as a binary string. (3)
- 4 Give a regular expression for the set of all strings not containing 101 as a substring (3)

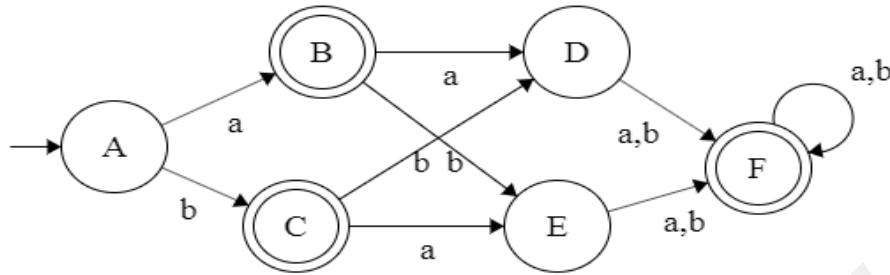
PART B*Answer any two full questions, each carries 9 marks.*

- 5 a) Convert the following NFA to DFA and describe the language it accepts. (5)
- $M = (\{P, Q, R, S, T\}, \{0,1\}, \delta, P, \{S, T\})$ and δ is given as:

	0	1
P	{P,Q}	{P}
Q	{R,S}	{T}
R	{P,R}	{T}
S	-	-
T	-	-

- b) Prove that “ A language L is accepted by some ϵ -NFA if and only if L is accepted by some NFA” (4)

- 6 a) State Myhill-Nerode theorem, Minimize the following DFA. (5)



- b) Find an equivalent ϵ -NFA for the following regular expression (4)

$(0 + 1)^*011$

- 7 a) Convert the following ϵ -NFA to NFA (4)

	ϵ	1	2	3
q0	\emptyset	{ q0 }	{ q1 }	{ q2 }
q1	{ q0 }	{ q1 }	{ q2 }	\emptyset
q2	{ q1 }	{ q2 }	\emptyset	{ q0 }

- b) Describe clearly the equivalent classes of the Canonical Myhill-Nerode relation (5)
for the language of binary strings with second-last symbol as 0.

PART C

Answer all questions, each carries 3 marks.

- 8 State the closure properties of regular sets. (3)
- 9 Define context free grammar. Consider the following CFG (3)

$$S \rightarrow aS \mid Sb \mid a \mid b$$

Prove by induction on the string length that no string in $L(G)$ has ba as substring.

- 10 Design a PDA to accept the set of strings with twice as many 0's as 1's. (3)
- 11 List the decision problems related with type 3 Formalism. (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) State pumping lemma for regular languages. Prove that the language $L = \{a^{n^2} \mid n > 0\}$ is not regular. (5)
- b) Convert the following grammar into Chomsky normal form (4)

$$S \rightarrow ASB \mid \epsilon, \quad A \rightarrow aAS \mid a, \quad B \rightarrow SbS \mid A \mid bb$$

- 13 a) Prove the equivalence of acceptance of a PDA by final state and empty stack. (6)
 b) Define a deterministic PDA. How a DPDA differs from a non-deterministic PDA? (3)

- 14 a) Let G be the grammar (4)

$$S \rightarrow aB|bA, \quad A \rightarrow a|aS|bAA, \quad B \rightarrow b|bS|aBB$$

For the string *aabbaabbba* find

- i) leftmost derivation, ii) parse tree, and iii) Is the grammar ambiguous?
 b) Design a PDA to accept the language $L = \{ww^R \mid w \in \{0,1\}^*\}$. (5)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Show that the language $L = \{ww \mid w \in \{a,b\}^*\}$ is not a CFL. (5)
 b) Design a TM to compute the 2's complement of a binary string. (5)
- 16 a) State and prove pumping lemma for context free languages. Mention the application of pumping lemma. (6)
 b) Design a Turing machine to accept , (4)
 $L = \{ w \in \{0,1\}^* \mid w \text{ has equal number of 0's and 1's} \}$.
- 17 a) Compare context sensitive grammar and context free grammar. Can we design a PDA for context sensitive languages? Justify your answer. (5)
 b) Design a TM to find the sum of two numbers m and n. Assume that initially the tape contains m number of 0s followed by # followed by n number of 0s (5)
- 18 a) Are there any languages which are not recursively enumerable, but accepted by a multi-tape Turing machine? Justify your answer. (5)
 b) Define formally Type 0, Type 1, Type 2 and Type 3 grammar. Show the corresponding automata for each class (5)
- 19 a) List the closure properties of Recursive Languages (4)
 b) Define a Universal Turing Machine (UTM). With the help of suitable arguments show the simulation of other Turing machines by a UTM. (6)
- 20 a) Compare recursive and recursively enumerable languages. (3)
 b) Show that the class of recursive languages is closed under complementation. (3)
 c) Show that the class of recursively enumerable languages are not closed under complementation. (4)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CS303

Course Name: SYSTEM SOFTWARE

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|---|-----|
| 1 | Write a sequence of instructions for SIC to set $\text{ALPHA} = \text{BETA} * 9 + \text{GAMMA}$. | (3) |
| 2 | List out the various registers used in SIC along with their purpose. | (3) |
| 3 | What is meant by forward reference? How it is resolved by two pass assembler? | (3) |
| 4 | Write down the format of Modification record. Describe each field with the help of an example. | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|--|-----|
| 5 | What are the various addressing modes supported by SIC/XE? With the help of an example, explain how to find target address during assembling in each case. | (9) |
| 6 | a) Distinguish between Application software and System Software | (3) |
| | b) Let A,B & C are arrays of 10 words each. Write a SIC/XE program to add the corresponding elements of A & B and store the result in C. | (6) |
| 7 | a) What are the functions of Operating System? | (3) |
| | b) With the aid of an algorithm explain the Second pass of a Two Pass Assembler. | (6) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | What are control sections? What is the advantage of using them? | (3) |
| 9 | Given an idle computer with no programs in memory, how do we get things started? | (3) |
| 10 | What are the uses of assembler directives EXTDEF and EXTREF? | (3) |
| 11 | What is the use of bitmask in program relocation? | (3) |

PART D

Answer any two full questions, each carries 9 marks.

- | | | |
|----|---|-----|
| 12 | a) Distinguish between Program Blocks and Control Section | (2) |
| | b) How the assembler handles multiple Program blocks? | (7) |
| 13 | a) Write short note on Dynamic Linking | (3) |

- b) Explain the algorithm for Pass 1 of Linking Loader. (6)
- 14 a) List and explain the different machine independent features of loaders (3)
- b) Explain the working of any one type of One pass Assembler (6)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Differentiate between keyword and positional macro parameters. (3)
- b) Explain the working of One pass Macro Processor. (7)
- 16 a) Is it possible to include labels in the body of macro definition? Justify your answer. (6)
- b) Write short note on concatenation of macro parameters within a character string. (4)
- 17 Explain the different types of conditional macro expansion statements and their implementation with examples. (10)
- 18 a) Draw the structure of a typical text editor and describe the functions of each block. (8)
- b) List out the main four tasks associated with the Document Editing Process. (2)
- 19 a) Describe the functions and capabilities of an Interactive debugging system. (6)
- b) List out the criteria that should be met by the user interface of an efficient debugging system. (4)
- 20 a) What is a Device Driver? What are the major design issues of a Device Driver? (5)
- b) Distinguish between Character and Block Device drivers. (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CS303

Course Name: SYSTEM SOFTWARE

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

		Marks
1	Explain three functions of Operating System	(3)
2	Write a sequence of instructions for SIC/ XE to find the average of three numbers, BETA, GAMMA and DELTA.	(3)
3	Explain the format of the object program generated by a two-pass SIC Assembler, highlighting the contents of each record type.	(3)
4	Explain the data structures used and their purposes in a two-pass assembler.	(3)

PART B

Answer any two full questions, each carries 9 marks.

5	Compare the features of Standard SIC and SIC/XE architecture.	(9)
6	a) Explain assembler directives. List any four assembler directives in SIC machine.	(5)
	b) Explain the concept of program relocation with an example.	(4)
7	Write the algorithms for Pass 1 and Pass 2 of a two-pass assembler	(9)

PART C

Answer all questions, each carries 3 marks.

8	Differentiate Define record and Refer record.	(3)
9	Explain how forward references are resolved during program assembling in a single pass assembler.	(3)
10	Give the absolute loader algorithm.	(3)
11	Explain the concept of Automatic Library Search.	(3)

PART D

Answer any two full questions, each carries 9 marks.

12	Differentiate Program Blocks and Control Sections. Explain how address calculation is performed in the case of Program Blocks.	(9)
13	a) Explain the working of Multipass Assemblers with an example.	(5)

- b) Explain Dynamic Linking with an example (4)
- 14 Which are the data structures used during the operation of a linking loader? Write the algorithm for Pass 2 of a Linking Loader (9)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) A code segment need to be repeatedly used in various parts of assembly language program and fast execution is also needed. Would you use a macro or a subroutine? Justify your answer with help of examples. (5)
- b) List and explain the different design options available for macroprocessors. (5)
- 16 Certain macro processor features are independent of the machine architecture. Give the details of such machine independent macro-processor features. (10)
- 17 Write the algorithm for one pass macro processor and explain the process, showing when and how the different data structures are used. (10)
- 18 Using a neat diagram, explain the structure of a text editor. (10)
- 19 A new hardware device is plugged into a system. Which is the appropriate system software needed for the proper working of the new hardware? Give its functionalities and general architecture. (10)
- 20 Write down the situations where debugging by induction, deduction and backtracking are used, explaining each process. (10)

Reg No.:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CS303

Course Name: SYSTEM SOFTWARE

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

- | | | Mark
s |
|---|---|-----------|
| 1 | Distinguish between an assembler and a compiler. Which are the different types of compilers? | (3) |
| 2 | Briefly describe the format of object program generated by SIC assembler. | (3) |
| 3 | 'System Software is machine dependent'. Justify the statement. | (3) |
| 4 | What are the uses of OPTAB and SYMTAB during the assembling process? Specify the uses of each during pass 1 and pass 2 of a two pass assembler. | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|---|-----|
| 5 | a) List out the differences between system software and application software. | (4) |
| | b) Design an algorithm for performing the pass 1 operations of a two pass assembler. | (5) |
| 6 | a) List and explain the different addressing modes and instruction formats used in SIC/XE architecture. | (5) |
| | b) Describe in detail about any 4 system softwares. | (4) |
| 7 | a) What will happen if a SIC program is loaded in a location different from the starting address specified in the program? Will the program work properly? Justify your answer. | (3) |
| | b) Explain program relocation with examples. | (6) |
- Is there a need to use modification records for the given SIC/XE program segment? Explain your answer. If yes, show the contents of modification record.

```

0000 COPY    START  0
.....
0006          +JSUB  RDREC
000A          LDA   LENGTH
.....
0033 LENGTH  RESW   1
.....
1036 RDREC   CLEAR  X

```

PART C

Answer all questions, each carries 3 marks.

- | | | |
|---|--|-----|
| 8 | Explain the format of Define and Refer Records. What are their uses? | (3) |
| 9 | What is a multi pass assembler? Explain with the help of an example, a situation | (3) |

- where we would need such an assembler.
- 10 Design an algorithm for an absolute loader. (3)
- 11 Differentiate between linking loader and linkage editor. (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Describe the concept of program blocks with a proper example. (4)
- b) Explain the working of a single pass assembler with an example. (5)
- 13 a) Justify the need for having two passes in a linking loader. Illustrate the data structures used for a linking loader, showing how they are used in each pass. (4)
- b) Give the algorithm for pass 2 of a linking loader. (5)
- 14 a) List and explain the different machine independent loader features. (4)
- b) What are control sections? Illustrate with an example, how control sections are used and linked in an assembly language program. (5)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Differentiate between character and block device drivers. (4)
- b) Explain the structure of text editor with the help of a diagram. (6)
- 16 a) What are the data structures required for a macroprocessor algorithm? Explain the format of each. (4)
- b) Design an iterative algorithm for a one pass macroprocessor. (6)
- 17 a) List and explain the different debugging techniques. (5)
- b) Write notes on conditional macro expansion. (5)
- 18 a) Differentiate between a macro and a subroutine. Illustrate macro definition and expansion using an example. (5)
- b) Describe the user interfaces used in a text editor. (5)
- 19 Explain the general design and anatomy of a device driver with the help of diagrams. (10)
- 20 a) What do you mean by recursive macro expansion? What are the possible problems associated with it? (5)
- b) Is it possible to use labels within the macro body? Explain your answer with the help of examples. Also illustrate a possible solution for the same. (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: CS303**Course Name: SYSTEM SOFTWARE**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks.*

Marks

- | | | |
|---|--|-----|
| 1 | Distinguish between interpreter and compiler. | (3) |
| 2 | Explain how floating point numbers are represented in SIC/XE. | (3) |
| 3 | List the basic assembler functions. | (3) |
| 4 | Consider the statements in SIC program. Consider the program being assembled using a 2 pass assembler. | (3) |

Line no	Location	Label	Opcode	Operand
10	1000	LENGTH	RESW	4
20	-----	NEW	WORD	3

What will be the address value assigned to the symbol NEW during pass 1?

PART B*Answer any two full questions, each carries 9 marks.*

- | | | |
|---|--|-----|
| 5 | a) What is the difference between the instructions LDA #5 and LDA FIVE? Explain how each instruction is executed. | (3) |
| | b) Design an algorithm for pass 1 operations of a two pass assembler for SIC architecture. | (6) |
| 6 | a) Compare the following with reference to SIC and SIC/XE machines: | (4) |
| | i. Memory | |
| | ii. Instruction format | |
| | b) Suppose the address associated with the symbol RETADR is 0030 and the machine equivalent code for STL is 14. Assemble the given SIC/XE instruction, by clearly indicating the instruction format, addressing mode and the setting of different flag bits, given the address value assigned to RETADR is 0030. | (5) |

Location	Label	Opcode	Operand
0000	FIRST	STL	RETA DR

- 7 a) Suppose RECORD contains a 100-byte record. Write a subroutine for SIC that will write this record onto device 05. (5)
- b) What is a relocatable program? Do all instructions of SIC/XE machine program need modification because of relocation? Justify your answer. (4)

PART C*Answer all questions, each carries 3 marks.*

- 8 Differentiate between control sections and program blocks with the help of an example. (3)
- 9 What is a load and go assembler? (3)
- 10 What is the use of bitmask in program relocation? Illustrate with example. (3)
- 11 Explain any one machine independent loader feature. (3)

PART D*Answer any two full questions, each carries 9 marks.*

- 12 a) Give the algorithm for pass 2 of a linking loader. (5)
- b) With a help of neat diagram explain what is a linkage editor? (4)
- 13 a) Employ multipass assembler to evaluate the following expressions. (6)

Expression No.	Loc	Source Statement		
1		HALFSZ	EQU	MAXLEN/2
2		MAXLEN	EQU	BUFEND-BUFFER
3		PREVBT	EQU	BUFFER-1
4	4034	BUFFER	RESB	4096
5	5034	BUFEND	EQU	*

- b) Give the algorithm for an absolute loader. (3)
- 14 a) Give the format and purpose of the different record types present in an object program that uses multiple control sections. (4)
- b) Develop the records (excluding header, text and end records) for the following control section named COPY (5)

Loc	Source Statement		
0000	COPY	START	0
		EXTDEF	BUFFER, BUFEND, LENGTH
		EXTREF	RDREC, WRREC
0000	FIRST	STL	RETADR
0003	CLOOP	+JSUB	RDREC
0007		LDA	LENGTH

000A	COMP	#0
000D	JEQ	ENDFIL
0010	+JSUB	WRREC
0014	J	CLOOP
0017	ENDFIL	LDA =C 'EOF'
001A	STA	BUFFER
001D	LDA	#3
0020	STA	LENGTH
0023	+JSUB	WRREC
0027	J	@RETADR
002A	RETADR	RESW 1
002D	LENGTH	RESW 1
	LTORG	
0030	*	=C 'EOF'
0033	BUFFER	RESB 4096
1033	BUFEND	EQU *
1000	MAXLEN	EQU BUFEND-BUFFER

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Explain the data structures and algorithm of a one pass macro-processor. (10)
- 16 a) What is meant by concatenation of macro parameter? (5)
- b) What is conditional macro expansion? (5)
- 17 a) What is meant by line-by-line macro processor? What are its advantages? (5)
- b) What are the important factors considered while designing general purpose macro processors? (5)
- 18 a) What are the functions of device drivers? (4)
- b) Distinguish between character and block device drivers. (6)
- 19 a) Explain the overview of editing process. (5)
- b) With a neat diagram show the relationship between viewing and editing buffer. (5)
- 20 a) Discuss the debugging functions and capabilities. (4)
- b) Write down the situations where debugging by induction, deduction and backtracking are used. (6)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CS305

Course Name: MICROPROCESSORS AND MICROCONTROLLERS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|---|-----|
| 1 | How does the 8086 processor access a word from an odd memory location?
How many memory cycles does it take? | (3) |
| 2 | Find the physical address of the destination operands referred in the following instructions, if DS=0223H, DI=0CCCH and SI=1234H
a) MOV [DI], AL
b) MOV [SI][56H], BL | (3) |
| 3 | What is the difference in the execution of an 8086 inter-segment and intra-segment CALL instruction? | (3) |
| 4 | Define the functions of the following 8086 assembler directives:
a) ASSUME b) EQU c) OFFSET | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|--|-----|
| 5 | Draw the Memory Read timing diagram of 8086 in Minimum mode. Describe the status of the relevant signals during each clock period. | (9) |
| 6 | Explain the addressing modes supported by 8086 with one example for each. | (9) |
| 7 | Write an 8086 assembly language program to find the count of even and odd numbers from a set of 10 sixteen bit numbers stored in location starting from a known address. Store the results in two different locations. | (9) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | Write the condition(s) which cause 8086 to perform a Type 1, Type 2 and Type 3 interrupts. | (3) |
| 9 | Discuss 8086 interrupt acknowledgement cycle. | (3) |
| 10 | Differentiate between I/O mapped I/O and memory mapped I/O. | (3) |
| 11 | Write short notes on scanned keyboard mode with 2-key lockout of 8279 keyboard/display controller. | (3) |

PART D

Answer any two full questions, each carries 9 marks.

- | | | |
|----|--|------------|
| 12 | Draw the architectural block diagram of 8259 Programmable Interrupt Controller and explain the role of each functional part. | (9) |
| 13 | a) What do you mean by Interrupt Vector Table (IVT)? The starting address for a type 7 interrupt-service procedure is 1112:1314. Show where and in what order this address should be placed in the 8086 IVT.
b) Briefly describe the control word format of 8255 PPI. | (5)
(4) |
| 14 | Design an interface between 8086 CPU and two chips of 16 x 8 EPROM and two chips of 32K x 8 RAM. Select the starting address of EPROM suitably. The RAM address must start at 00000H. | (9) |

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Discuss the selection criteria of a typical microcontroller. (4)
b) Explain about the programmable I/O ports of 8051 microcontroller. (6)
- 16 a) How the 8051 differentiate between internal and external program memory? (1)
b) Discuss the structure of internal data memory (RAM) of 8051. (5)
c) What is the size of 8051 Stack Pointer (SP)? Discuss the operation of 8051 stack. (4)
- 17 a) Describe the program status word (PSW) of 8051. (3)
b) How many interrupts have been provided in 8051? Explain the necessary conditions which cause these interrupts to be generated. Also arrange them in the decreasing order of priority. (7)
- 18 Describe the addressing modes of 8051 with one example for each. (10)
- 19 a) What is the difference between LCALL and ACALL instructions? (2)
b) Write an 8051 assembly language program to find the largest of ten numbers stored in RAM location 47H onwards. Output the result in port1. (6)
c) Is "DIV A, R1" a valid instruction? Justify your answer. (2)
- 20 Explain the architecture and modes of operation of 8254/8253 programmable Timer/ Counter with necessary diagrams. (10)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CS305

Course Name: MICROPROCESSORS AND MICROCONTROLLERS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

- | | | Marks |
|---|--|-------|
| 1 | Draw the timing diagram for the 8086 minimum mode memory write operation. | (3) |
| 2 | With an example describe the register and register relative addressing mode of 8086. | (3) |
| 3 | List any six features of 8088 microprocessor. | (3) |
| 4 | Describe the use of 8086 instructions: PUSH, POP and PUSHF | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|--|-----|
| 5 | a) With a neat diagram describe how 8086 memory is organised at physical level. | (5) |
| | b) With the help of an example show how stack can be used for passing parameters to a subroutine in assembly programs. | (4) |
| 6 | a) Write an 8086 assembly program to find the largest number from a list of numbers. | (9) |
| 7 | a) What are assembler directives? List any four assembler directives and its usage. | (5) |
| | b) What are the different information conveyed by the Queue status signals QS0 and QS1 of 8086 in maximum mode? | (4) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | What are the basic categories of 8086 software interrupts? | (3) |
| 9 | Describe the control word format for the BSR mode of 8255. | (3) |
| 10 | What is an Interrupt Service Routine? How do we get the address of the ISR corresponding to a given interrupt in 8086? | (3) |
| 11 | What are the purposes of the signals DRQ, TC and MARK in 8257? | (3) |

PART D

Answer any two full questions, each carries 9 marks.

- | | | |
|----|---|-----|
| 12 | With a neat diagram describe how 8259 can be used for handling multiple interrupts? | (9) |
| 13 | With a neat diagram describe the architecture of 8255. | (9) |

- 14 a) What are the different input modes of 8279? (5)
b) Describe the sequence of steps for developing and deploying an ISR for handling interrupt in 8086. (4)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Describe different types of microcontrollers. (5)
b) What are the different criteria that should be considered while selecting a microcontroller? (5)
- 16 a) What are the different operating modes of 8253? (6)
b) Describe any four control transfer instructions of 8051? (4)
- 17 a) What are the Special Purpose Registers of 8051? (4)
b) Write the structure of Program Status Word (PSW) of 8051? (3)
c) How the stack operations of 8051 differ from 8086? (3)
- 18 Write an 8051 program to count the number of 1s in the binary representation of a given number. (10)
- 19 Explain the internal memory organization of 8051. (10)
- 20 a) Explain any five addressing modes of 8051 with example. (5)
b) What is the use of following 8051 instructions :
ADDC, SUBB, CPL, RLC and SWAP? (5)

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Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CS305

Course Name: MICROPROCESSORS AND MICROCONTROLLERS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|---|-----|
| 1 | Find the physical address of the memory locations referred by the following instructions, when DS=BC00H, SI=0023H, BX=0012H
a) MOV AL,[SI] b) MOV [BX][SI],DL | (3) |
| 2 | What are the differences between 8086 and 8088 microprocessors? | (3) |
| 3 | Explain the following addressing modes of 8086 with suitable examples.
a) Immediate b) Register Indirect | (3) |
| 4 | Explain the differences between 8086 procedure call and macro call | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|---|-----|
| 5 | Explain minimum mode configuration of 8086. | (9) |
| 6 | Explain register set of 8086. | (9) |
| 7 | Write an 8086 assembly language program to find the sum of all numbers less than 50 in an array of n numbers. | (9) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | Explain IO port address decoding with an example. | (3) |
| 9 | Explain the events performed in 8086 when an interrupt occurs. | (3) |
| 10 | What is the mode and I/O configurations for various ports in 8255 after its control register is loaded with 86H. | (3) |
| 11 | Explain how the INT n instruction finds the starting address of its interrupt service routine | (3) |

PART D

Answer any two full questions, each carries 9 marks.

- | | | |
|------|---|-----|
| 12 | Explain the block diagram of 8259, priority interrupt controller. | (9) |
| 13 | Interface 32Kx8 RAM using four numbers of 8Kx8 memory chips and 16Kx8 ROM using two numbers of 8Kx8 EPROM chips. The address map is given as RAM starts at 00000H and ROM ends at FFFFFH. | (9) |
| 14 a | Explain the features of 8257, DMA controller. | (4) |

- b What are the differences between peripheral I/O and memory mapped I/O schemes (5)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) What are the differences between microprocessors and microcontrollers? (4)
b) Explain programmable IO ports of 8051 microcontroller. (6)
- 16 Explain the architecture of 8051 microcontroller using block diagram. (10)
- 17 Explain the architecture of 8254/8253 programmable timer using block diagram. (10)
- 18 a) Describe the factors that affect the selection of processor for a microcontroller based design. (5)
b) Explain the working of stack of 8051 microcontroller. (5)
- 19 Explain addressing modes of 8051 microcontroller. (10)
- 20 a) Write an 8051 microcontroller assembly language program to check whether the given 8-bit number has odd number of ones. (6)
b) Explain the working of the following instructions with suitable example. (4)
a) MOVX b) XCHD c) AJMP d) SWAP

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: CS305**Course Name: MICROPROCESSORS AND MICROCONTROLLERS**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks.*

Marks

- | | | |
|---|---|-----|
| 1 | Explain logical memory organization of 8086. | (3) |
| 2 | Explain memory read operation in minimum mode of 8086 with the help of a timing diagram. | (3) |
| 3 | Explain the usage of the following assembler directives with suitable example.
a) EQU b) SEGMENT c) ASSUME | (3) |
| 4 | Explain the working of the following instructions with suitable example.
a) IN b) SAR | (3) |

PART B*Answer any two full questions, each carries 9 marks.*

- | | | |
|---|--|------------|
| 5 | Write an 8086-assembly language program to find even numbers from an array of n, 8-bit numbers and store the even numbers in a separate array. | (9) |
| 6 | Explain maximum mode configuration of 8086 microprocessor | (9) |
| 7 | a) Differentiate 8086 and 8088 microprocessors.
b) Explain 8086 macro definition and macro call with suitable example. | (4)
(5) |

PART C*Answer all questions, each carries 3 marks.*

- | | | |
|----|---|-----|
| 8 | Explain various categories of interrupts available in 8086. | (3) |
| 9 | Explain the interfacing of an IO device to 8086 using peripheral IO method. | (3) |
| 10 | Explain how the priority resolver block of 8259 select the request to be served next. | (3) |
| 11 | Explain output modes of 8279, programmable keyboard/display interface. | (3) |

PART D*Answer any two full questions, each carries 9 marks.*

- | | | |
|----|---|------------|
| 12 | a) Explain the Mode 2 operation of 8255.
b) What are the activities done by 8086 on receiving an interrupt request? | (5)
(4) |
| 13 | a) What is meant by maskable and non-maskable interrupts?
b) Write the role of 8259A, Programmable Interrupt Controller. | (3)
(6) |

- 14 Interface two numbers of 16Kx8 EPROM and 2 numbers of 4Kx8 RAM to 8086. Select suitable address map. (9)

PART E

Answer any four full questions, each carries 10 marks.

- 15 Describe Internal data memory organization of 8051 microcontroller. (10)
- 16 a) Explain PSW of 8051 microcontroller (5)
b) Explain how external memories can be interfaced to 8051 microcontroller (5)
- 17 a) Explain the organization of stack in 8051 microcontrollers. (5)
b) Explain the sources of interrupts of 8051 microcontroller. (5)
- 18 a) What is the role of IE and IP registers of 8051 microcontroller (5)
b) Describe the following instructions of 8051 microcontroller. (5)
a) AJMP b) SJMP c) XCHD d) MOVX e) SWAP
- 19 a) Write an 8051 assembly language program to count the occurrence of a given byte in a sequence of n bytes. (7)
b) Write the criteria for selecting a microcontroller. (3)
- 20 a) Explain the block diagram of 8254, programmable interval timer. (6)
b) Explain the following addressing modes of 8051 microcontroller. (4)
a) Register indirect b) Indexed

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CS 307

Course Name: DATA COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|--|-----|
| 1 | What are the three parameters that represent a general sine wave? Explain with suitable figures. | (3) |
| 2 | Which wireless propagation is suitable for satellite communication? Justify your answer. | (3) |
| 3 | How the construction of optical fibre helps in reducing the interference? Draw the structure of optical fibre. | (3) |
| 4 | Discuss the significance of SNR in determining the performance of a data communication system. | (3) |

()

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|---|-----|
| 5 | a) Explain the role of Shannon capacity formula in determining the channel capacity. | (4) |
| | b) Suppose the spectrum of a channel is between 3MHz and 4MHz and SNR_{dB} is 24 dB. What is the capacity of the channel? Based on Nyquist's formula, how many signalling levels are required? | (5) |
| 6 | a) Explain different wireless propagation modes with suitable diagrams. | (6) |
| | b) Given a receiver with an effective noise temperature of 300 K and a 12-MHz bandwidth, what is the thermal noise level at the receiver's output? | (3) |
| 7 | a) With the help of suitable diagrams, differentiate multi-mode and single-mode optical fibres. How are the rays propagated in step-index and graded-index multi-mode fibres? | (6) |
| | b) A signal travels from point A to point B through a transmission channel that has -0.4dB/km loss. If the signal at A has a power of 3mW, what is the power of the signal at point B which is 10 km away from A? | (3) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|---|-----|
| 8 | Compare the terms signal element and data element with suitable diagrams. | (3) |
| 9 | Show the equivalent square wave pattern of the bit string 00110101 using NRZ-I, NRZL and Manchester encoding schemes. | (3) |
| 10 | Which of the multiplexing technique is suitable for fiber-optics links? Explain | (3) |

with reasoning.

- 11 How upstream and downstream data transfer is done in cable modem? (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) What is the advantage of differential encoding? Discuss differential Manchester encoding scheme with example. (3)
- b) Explain the process involved in PCM with neat diagrams. (6)
- 13 a) Explain the process of statistical time division multiplexing. (7)
- b) Explain the necessity of pulse stuffing in synchronous time division multiplexing. (2)
- 14 a) Why you need scrambling in digital encoding? Explain any one scrambling technique. (7)
- b) What is the Nyquist sampling rate for a low pass signal with bandwidth of 300 Khz? (2)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Discuss the effect of timing error in asynchronous transmission. Draw suitable figures. (5)
- b) Which are the different types of errors? Explain with examples (2)
- c) Assuming even parity, find the parity bit for each of the following data : (3)
- i. 1010101 ii. 000000 iii. 10000101
- 16 a) Define Hamming distance and minimum Hamming distance? Calculate the pair wise Hamming distance and minimum Hamming distance among the following code words: 100000, 100110, 111101 (6)
- b) What should be the minimum hamming distance for detecting and correcting upto n number of errors? Discuss the reasoning with some example. (4)
- 17 Using CRC, given the dataword 11110000 and the divisor 10011 (10)
- i. Show the generation of the codeword at the sender site
- ii. Show the checking of the codeword at the receiver site
- 18 Explain direct sequence spread spectrum using BPSK with neat diagrams. (10)
- 19 a) Compare and contrast circuit switching and packet switching techniques (4)
- b) Describe the different types of switching fabrics used in Packet switches. (6)
- 20 Explain the datagram approach in packet switching. (10)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CS 307

Course Name: DATA COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|---|-----|
| 1 | Describe simplex, half-duplex and full-duplex transmission modes with suitable examples. | (3) |
| 2 | Identify the significance of Nyquist bandwidth and Shannon capacity formula in determining the performance of communication in a network. | (3) |
| 3 | Discuss time domain and frequency domain concept of a signal . Draw the frequency domain plot of a periodic signal. | (3) |
| 4 | How the twisting affects performance in twisted pair cable ? | (3) |
| | | () |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|---|-----|
| 5 | a) What are the various transmission impairments and explain how they affect performance of a communication link? | (9) |
| 6 | a) Define Channel Capacity. Calculate the appropriate bit rate and signal levels for a channel with 100 Mhz bandwidth and SNR of 255. | (5) |
| | b) Compare terrestrial and satellite microwave transmission. | (4) |
| 7 | a) Explain the working principle of parabolic reflective antenna with suitable diagrams. | (5) |
| | b) For a parabolic reflective antenna with a diameter of 4 m, operating at 13 GHz, what is the effective area and the antenna gain? | (4) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | Name any two line coding schemes which provide self-synchronization. Explain with reasoning. Draw the pattern for any one of such scheme for the following data: 10101111. | (3) |
| 9 | Explain how Statistical TDM utilizes channel bandwidth better than Synchronous TDM. | (3) |
| 10 | How interference is avoided in frequency division multiplexing? Explain with suitable figures. | (3) |

- 11 Explain SONET/SDH frame format. (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Encode the bit stream **10101010** into the following line coding schemes assuming that the last signal level has been negative: (6)
- i) NRZ-I
 - ii) NRZL
 - iii) Manchester
 - iv) Differential Manchester
 - v) Bipolar AMI (Most recent preceding 1 bit has negative voltage)
 - vi) Pseudoternary (Most recent preceding 1 bit has negative voltage)
- b) Convert the bit stream 101010 in to analog signals by using ASK, Binary FSK and Binary PSK (3)
- 13 a) Explain Frequency Division Multiplexing process. (6)
- b) Discuss Digital Carrier Systems. (3)
- 14 a) With neat diagram, explain delta modulation technique. (6)
- b) Discuss wave length division multiplexing. (3)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Differentiate Synchronous and Asynchronous transmissions (5)
- b) How errors are detected using parity checking? What are the limitations of parity checking? (5)
- 16 a) Using CRC, given the dataword 1010011110 and the divisor 10111 (10)
- i. Show the generation of the codeword at the sender site
 - ii. Show the checking of the codeword at the receiver site
- 17 a) An error detection and correction scheme has a minimum Hamming distance, $d_{\min}=6$. (5)
- i) How many bit errors can it detect?
 - ii) How many bit errors can it correct?
- b) What is the Hamming distance for each of the following codewords: (4)
- a. d (10000, 11000)
 - b. d (10101, 10010)

c. d (11111,11111)

d. d (000, 100)

- 18 a) Discuss Frequency hopping spread spectrum technique (10)
- 19 a) What is Circuit switching? Explain the three phases in Circuit switching with suitable diagrams. (10)
- 20 a) Compare and contrast Datagram and Virtual-circuit packet switched networks? (5)
- b) With the help of a neat block diagram, explain the structure of a packet switch. (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B. TECH DEGREE EXAMINATION(R&S), DECEMBER 2019
Course Code: CS307
Course Name: DATA COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|--|-----|
| 1 | Given a receiver with an effective noise temperature of 294k and a 10 MHz bandwidth. Find out the thermal noise level at the receiver's output in dBW? | (3) |
| 2 | Define frequency, phase and wavelength of a signal | (3) |
| 3 | What are the advantages of optical fiber cable compared to twisted pair cable? | (3) |
| 4 | Explain the reflective property of a parabolic antenna? | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|--|------------|
| 5 | a) If the spectrum of a channel is between 3MHz and 4 MHz and $SNR_{dB} = 24$ dB. Then calculate the Shannon Channel capacity? Also find out the number of levels required to achieve the above capacity, by using Nyquist's formula?
b) Compare multimode step index fiber and multimode graded index fiber. | (5)
(4) |
| 6 | a) Explain analog and digital data transmission.
b) Describe briefly ground wave propagation. | (4)
(5) |
| 7 | a) Explain the different types of noise that affect the performance of a communication system?
b) Give the physical description of satellite microwave communication system. Mention some applications. | (4)
(5) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | Encode the bit pattern 01001100011 using Differential Manchester encoding technique. | (3) |
| 9 | Define Sampling Theorem. | (3) |
| 10 | What is byte interleaving technique in Time Division Multiplexing | (3) |

- 11 Draw the STS-1 frame format of SONET. (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) The carrier frequency and difference frequency of an MFSK signal are 250 kHz and 25 KHz. Given that the number of different signal elements (M) is 8 (L= 3 bits). Find out the different frequency assignments for each of the eight possible 3 bit data combinations. (5)
- b) Justify that the frequency spectrum of input signal will move to high frequency bands by FDM process. (4)
- 13 a) Explain any one analog data to analog signal encoding method with neat waveform. (4)
- b) In a CDMA process two users are having the codes as given below. (5)
- User1: 1,1,1,1
User2: 1,-1,-1,1
- Explain the data transmission process if user1 wants to transmit a bit 0 and user2 wants to transmit a bit 1.
- 14 a) Describe the two main distortions that can be occurred in a Delta modulated waveform. How can it be avoided? (4)
- b) Differentiate statistical TDM and Synchronous TDM using suitable diagrams. (5)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Which are the different types of error? (4)
- b) Explain asynchronous and synchronous data transmission modes with frame structures? (6)
- 16 a) Compare packet switching and circuit switching. (4)
- b) Describe the three phases in a circuit switching operation. (6)
- 17 a) In a CRC error detecting scheme, choose divisor polynomial $P: x^4 + x + 1$. Encode the bits 110101011. (7)
- b) What is hamming distance? (3)
- 18 a) Explain the general model of spread spectrum in digital communication system. (5)
- b) How Frequency Hopping Spread Spectrum(FHSS) spreads the baseband signal for transmission? (5)

- 19 a) Generate the CRC code for the data word of 110010101. The divisor is 10101. (5)
b) Explain 2-dimensional parity check with an example. (5)
- 20 a) Explain virtual circuit approach in packet switching. (5)
b) Explain datagram approach in packet switching. (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: CS307**Course Name: DATA COMMUNICATION**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks.*

Marks

- | | | |
|---|---|-----|
| 1 | Explain the three most significant transmission impairments. | (3) |
| 2 | Express the Time domain and frequency domain representations of a signal with frequencies 0, 8 and 16Hz. | (3) |
| 3 | Transmission characteristics of Fibre Optic cable differs from Coaxial cable. How? | (3) |
| 4 | For multicast communications which type of wireless transmission waves are suitable? Justify your answer. | (3) |

PART B*Answer any two full questions, each carries 9 marks.*

- | | | |
|---|---|-----|
| 5 | a) A telephone line is known to have a loss of 20dB. The input signal power is measured as 0.5W, and the output noise level is measured as 4.5μW. Using this information, calculate the output signal to noise ratio in dB. | (5) |
| | b) Find the maximum distance between two antennas for LOS transmission if one antenna is 100 m high and the other is at ground level. | (4) |
| 6 | a) Explain in detail transmission modes of Fibre optic cable? | (5) |
| | b) How capacity of a system is determined in the presence of noise? We have a channel with a 1MHz bandwidth. The SNR for this channel is 63. Then calculate channel capacity. | (4) |
| 7 | a) How Nyquist theorem applied for a noiseless channel? We need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need? | (5) |
| | b) Briefly discuss Line of Sight propagation. | (4) |

PART C*Answer all questions, each carries 3 marks.*

- 8 Differentiate between NRZL and NRZI encoding techniques with examples. (3)
- 9 Four 1-kbps connections are multiplexed together. A unit is 1 bit. Find (3)
- (a) The duration of 1 bit before multiplexing,
- (b) The transmission rate of the link,
- (c) The duration of a time slot.
- 10 Explain the various steps involved in Pulse Code Modulation. (3)
- 11 Write short note on CDMA. (3)

PART D*Answer any two full questions, each carries 9 marks.*

- 12 a) We have an available bandwidth of 100 kHz which spans from 200 to 300 kHz. What are the carrier frequency and the bit rate if we modulated our data by using ASK with $d = 1$? (5)
- b) Explain SONET frame format? (4)
- 13 a) Draw the Manchester and Differential Manchester encoding schemes for the data 01001100011. (4)
- b) Write the importance of Digital carrier system. (5)
- 14 a) A multiplexer combines four 100-kbps channels using a time slot of 2 bits. Show the output with four arbitrary inputs. What is the frame rate? What is the frame duration? What is the bit rate? What is the bit duration? (5)
- b) What is the total bandwidth required for frequency modulation. Explain with neat sketch. (4)

PART E*Answer any four full questions, each carries 10 marks.*

- 15 a) Compare the characteristics of Synchronous and Asynchronous transmission. (5)
- b) The data to be transmitted is given below. If it is send with odd parity, what will be the parity bit generated? (5)
- a) 11010
- b) 000000
- c) 01010000
- d) 11111
- e) 0000110
- 16 Using CRC, given the data word 100100 and the divisor is 1101 (10)

- i. Show the generation of the code word at sender site
 - ii. Show the checking of code word at receiver site
- 17 a) Calculate the pair wise hamming distance among following pair of code words (6)
and find the minimum Hamming distance?
- a) (10101, 11110, 01011)
 - b) (00011110, 10101001, 10100110, 00001110)
- b) Define different types of errors occur in data transmission with example. (4)
- 18 a) Why is circuit switching inefficient for transmission of nonvoice data? (5)
- b) Discuss the transmission of packets using the datagram approach in packet switching. (5)
- 19 a) Explain the General Model of Spread Spectrum System. (5)
- b) Explain direct sequence spread spectrum with neat sketch. (5)
- 20 a) Show the characteristics of Frequency Hopping Spread Spectrum System. (4)
- b) Compare the mechanism of space division switch to the mechanism of time division switch? (6)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
V SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CS309

Course Name: GRAPH THEORY AND COMBINATORICS

Max. Marks: 100

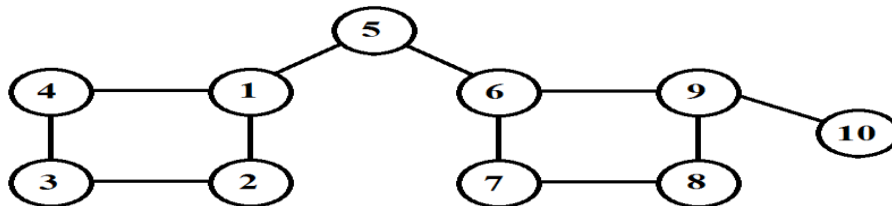
Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

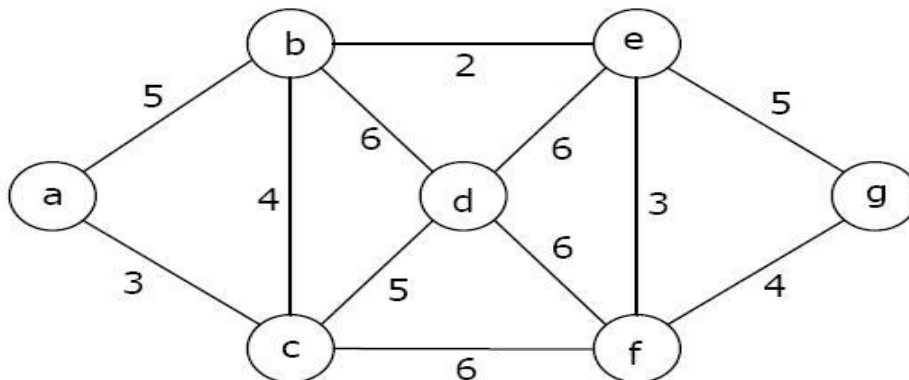
Marks

- 1 Print a Walk, trail, path and cycle on the graph below. 3



- 2 Define pendant vertex, isolated vertex and null graph with an example each. 3

- 3 State travelling salesman problem. Print a travelling salesman's tour on the graph below. 3

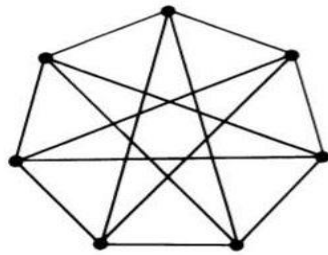


- 4 Prove Dirac's theorem for Hamiltonicity. 3

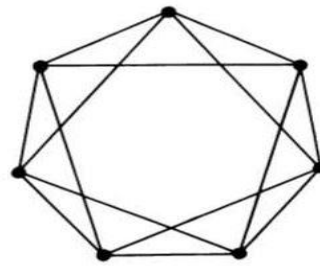
PART B

Answer any two full questions, each carries 9 marks.

- 5 a) Define isomorphism of graphs. Show that the graphs (a) and (b) are isomorphic. 4

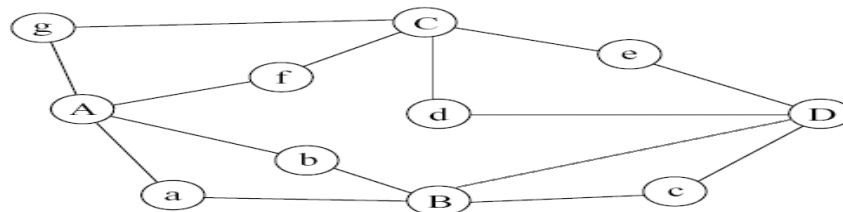


(a)

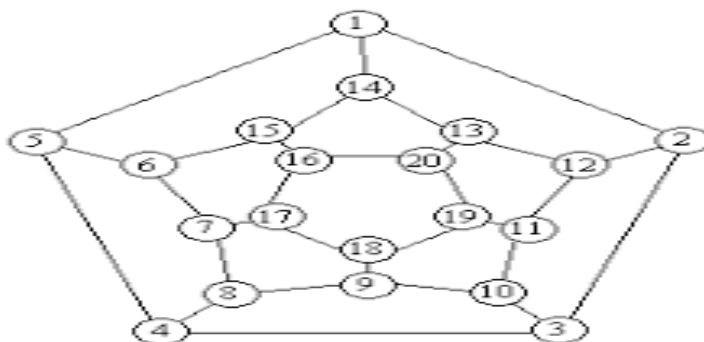


(b)

- b) Define subgraph. Give two subgraphs of the above graph.(Fig. a) 2
- c) Consider a complete graph G with 11 vertices. 3
1. Find the maximum number of edges possible in G
 2. Find the number of edge-disjoint Hamiltonian circuits in G
- 6 a) Draw a simple disconnected graph with 10 vertices, 4 components and maximum 3
- number of edges.
- b) Explain any two applications of graphs. 2
- c) Check whether the given graph is an Euler graph and if yes, give the Euler line. 4
- Justify your answer.



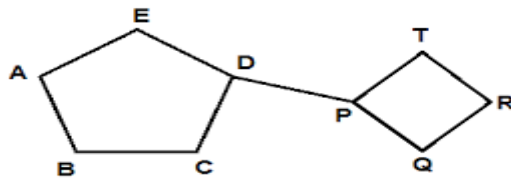
- 7 a) Prove or disprove: If every vertex of a simple graph G has degree 2, then G is a 3
- cycle.
- b) Give Hamiltonian circuit of the following graph. 3



- c) In a graph G let p_1 and p_2 be two different paths between two given vertices. 3
- Prove that ringsum of p_1 and p_2 is a circuit or a set of circuits.

PART C*Answer all questions, each carries 3 marks.*

- 8 Prove that in a graph G , if there is exactly one path between every pair of vertices, then G is a tree. 3
- 9 Given a spanning tree of a graph, how will you find out all spanning trees? 3
- 10 List all cut sets of the following graph. 3



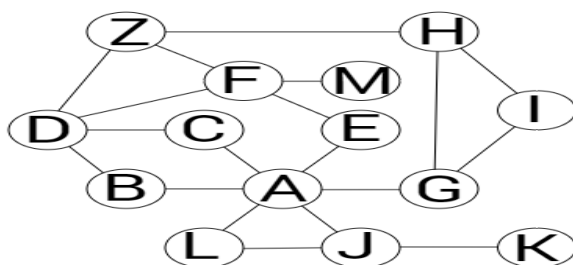
- 11 Prove that every circuit has an even number of edges in common with any cut set. 3

PART D*Answer any two full questions, each carries 9 marks.*

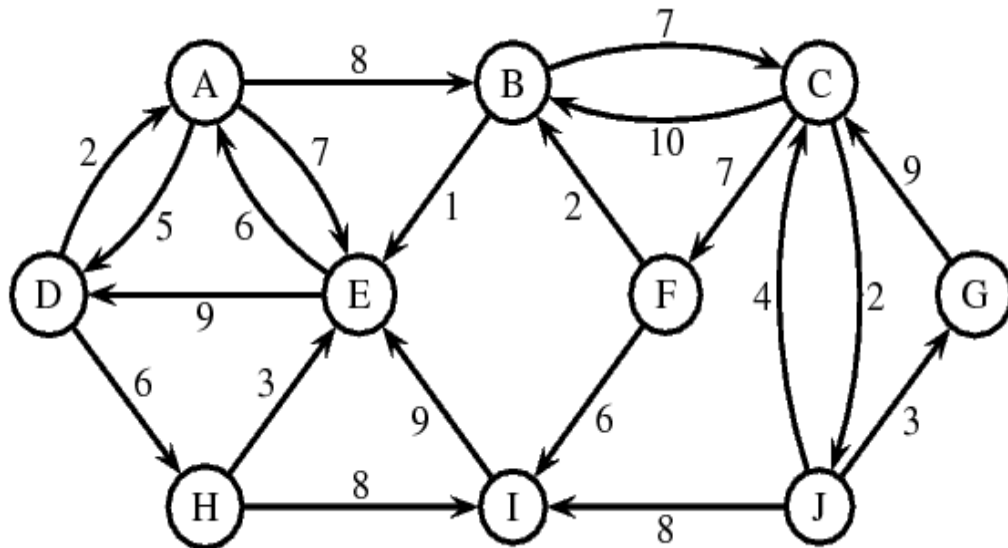
- 12 a) Define a tree. Give any 4 properties of trees. 3
- b) Prove that a graph is a tree if and only if it is loop-less and has exactly one spanning tree. 3
- c) Prove that every circuit has an even number of edges in common with any cut set. 3
- 13 a) Prove that every tree has either one or two centers. 3
- b) Write short notes on geometric dual and combinatorial dual. 6
- 14 a) Draw a connected graph G and find two spanning trees T_1 and T_2 of G such that the distance $(T_1, T_2) = 3$. Find the branch set, chord set, rank and nullity of T_1 . 4
- b) Construct a graph G with the following properties: Edge connectivity = 4, Vertex connectivity = 3 and degree of every vertex of G is greater than or equal to 5. 5

PART E*Answer any four full questions, each carries 10 marks.*

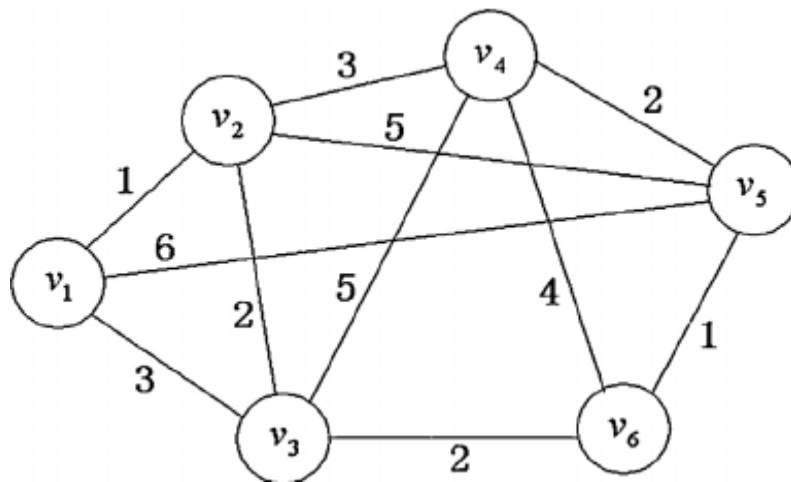
- 15 a) Give incidence matrix of the following graph. 3



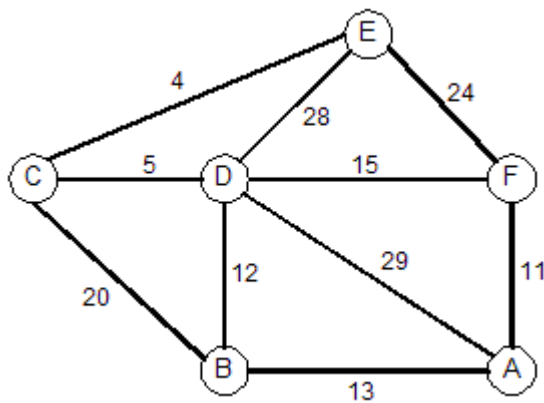
- b) Prove that two graphs G_1 and G_2 are isomorphic if and only if their incidence matrices $A(G_1)$ and $A(G_2)$ differ only by permutations of rows and columns. 2
- c) Give Dijkstra's algorithm to find shortest path between a vertex pair. Use it to find shortest path between A and G. 5



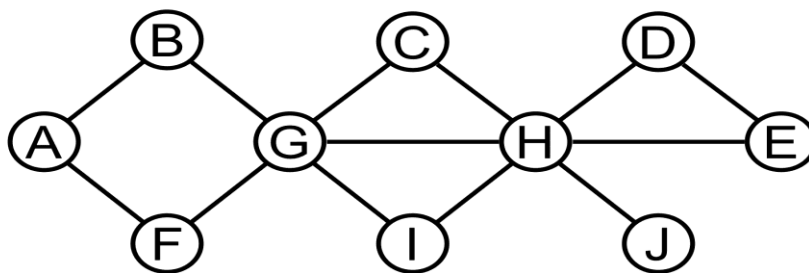
- 16 a) Prove that if B is a circuit matrix of a connected graph G with n vertices and e edges, then rank of B is $e-n+1$. 3
- b) How will you get fundamental circuit matrix from a circuit matrix. Derive the rank of a fundamental circuit matrix. 2
- c) Explain successor listing and incidence matrix methods used in computer representation of a graph? 5
- 17 a) Prove that the rank of cut set matrix $C(G)$ is equal to rank of the incidence matrix $A(G)$, which equals the rank of the graph G . 3
- b) Define path matrix. What is the disadvantage of path matrix compared to other matrices. 2
- c) Find a minimum spanning tree of the following graph. Also give its rank and nullity. 5



- 18 a) If $A(G)$ is an incidence matrix of a connected graph G with n vertices, then the rank of $A(G)$ is $n-1$. 5
- b) How is Kruskal's algorithm used to find minimum cost spanning tree of a graph. 5
Find a minimum spanning tree in the graph below.



- 19 a) Write cut set matrix of the following graph. Give its rank. 5



- b) Give an algorithm to check whether a graph is connected or not. How it can be implemented with an adjacency matrix. 5
- 20 a) Give any five properties of circuit matrix. 5
- b) How are edge listing and linear arrays used in computer representation of a graph? 5

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CS309

Course Name: GRAPH THEORY AND COMBINATORICS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

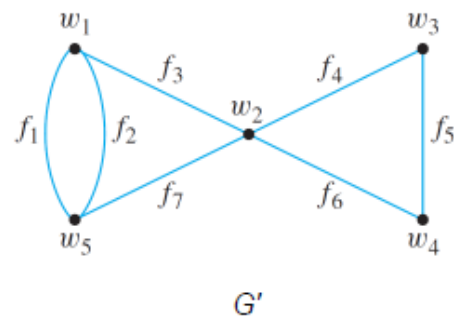
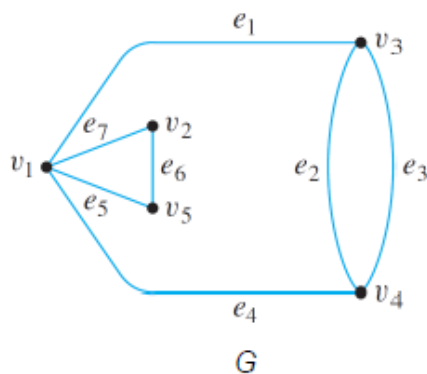
Marks

- | | | |
|---|---|-----|
| 1 | Define the terms a) Walk b) Path and c) Circuit with an example. | (3) |
| 2 | Prove that the no of vertices of odd degree in a graph is always even | (3) |
| 3 | Draw a graph that has a Hamiltonian path but does not have a Hamiltonian circuit. | (3) |
| 4 | Differentiate between Symmetric and Asymmetric digraphs with examples and draw a complete symmetric digraph of four vertices. | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|---|-----|
| 5 | a) Prove that a simple graph with n vertices and k components can have at most $(n-k)(n-k+1)/2$ edges | (4) |
| | b) Define Isomorphism of graphs. Check whether the two graphs are isomorphic or not | (5) |



- | | | |
|---|---|-----|
| 6 | a) Define Euler graph. Check whether the graph is an euler graph or not. If yes, give the Euler line and justify your answer. | (5) |
|---|---|-----|



- | | | |
|----|---|-----|
| b) | Prove that a connected graph G is an Euler graph if and only if all vertices of G are of even degree. | (4) |
|----|---|-----|

even degree.

- 7 a) State travelling salesman problem and how TSP solution is related to Hamiltonian circuits. (5)
- b) State and Prove Dirac's Theorem for Hamiltonicity. (4)

PART C

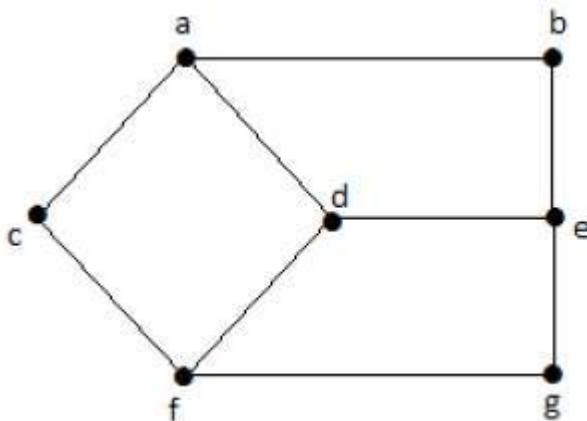
Answer all questions, each carries 3 marks.

- 8 Prove that the distance between the vertices of a connected graph is a metric (3)
- 9 List down any two properties of a tree and also prove the following theorem: A graph is a tree if and only if it is minimally connected. (3)
- 10 Define the terms vertex connectivity and edge connectivity with examples. (3)
- 11 Give the different representations of a planar graph. (3)

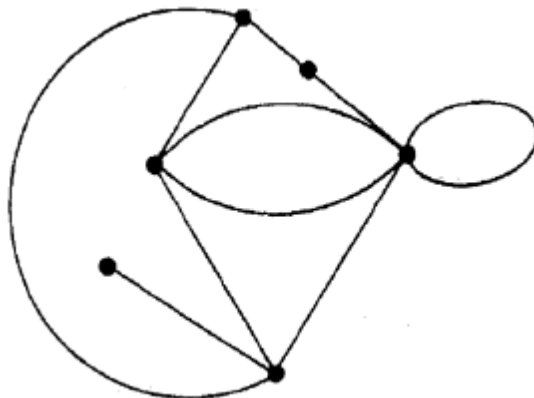
PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Find the eccentricity of all vertices in the graph G given below and also mark the center, radius and diameter of G (6)

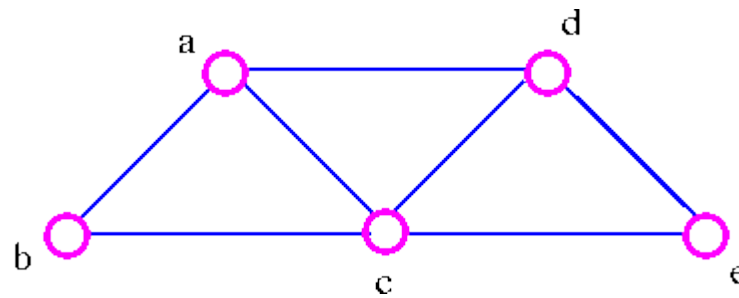


- b) State and prove Cayley's theorem (3)
- 13 a) Find the Geometrical dual (G^*) of the graph G given below (5)



- b) List out the properties stating the relationship between the graph G and its dual G^* (4)

- 14 a) Consider the graph G and any one of its spanning tree T. Find all fundamental circuits and fundamental cut sets with respect to the spanning tree T. (6)



- b) Prove that “Every cut set in a connected graph G must contain atleast one branch of every spanning tree of G”. (3)

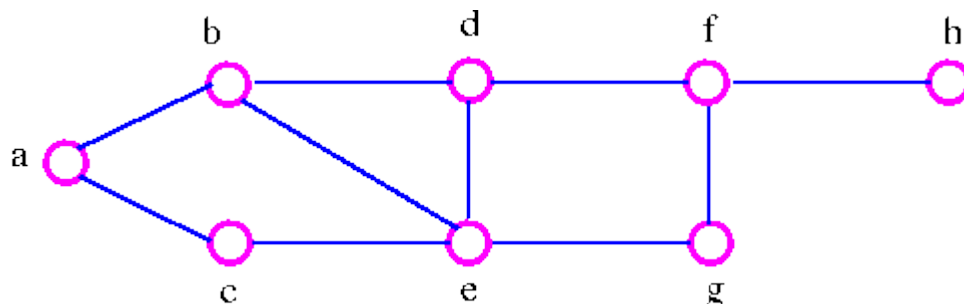
PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Define Adjacency Matrix $X(G)$ of a graph. Determine the properties of adjacency matrix. (6)
- b) Draw the graph represented by the following adjacency matrix. (4)

$$X(G) = \begin{pmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{pmatrix}$$

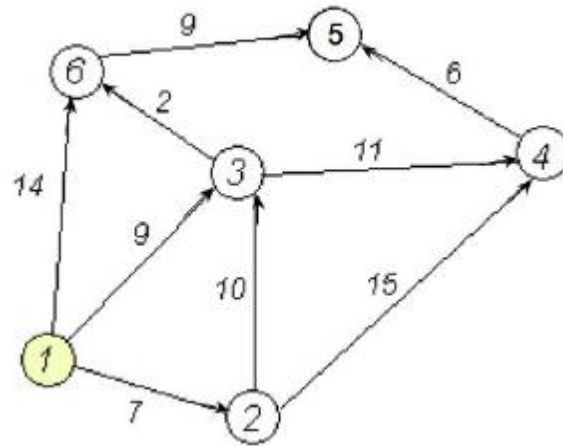
- 16 a) Obtain a cut set matrix for the following graph (6)



- b) Define path matrix. Determine the properties of a path matrix. (4)
- 17 a) Explain edge listing and successor listing methods used in computer representation of graphs (4)
- b) Draw the flow chart to determine connectedness and components of a graph (6)
- 18 Draw a flowchart indicating all the five conditions to find the spanning tree /spanning (10)

forest. Apply it to find the spanning tree /spanning forest for any graph of your choice.

- 19 Write Dijkstra's Shortest path algorithm and apply this algorithm to find the shortest path (10)
path



- 20 Write Kruskal's algorithm to find the minimum spanning tree of a graph G .Apply it (10)
to find the MST for the graph given below

