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KOLHAPUR INSTITUTE OF TECHNOLOGY'S,
COLLEGE OF ENGINEERING (AUTONOMOUS), KOLHAPUR
(AFFILIATED TO SHIVAJI UNIVERSITY, KOLHAPUR)

Exam. Cell

D.S.Y. B.Tech. (Computer Science & Engineering)

(Semester- IV)

END SEMESTER EXAMINATION, AUGUST- 2022

Course Code : UCSE0401

Course Name : Automata Theory

Day and Date : Sunday , 31-Jul-2022 **PRN :** 2122010004

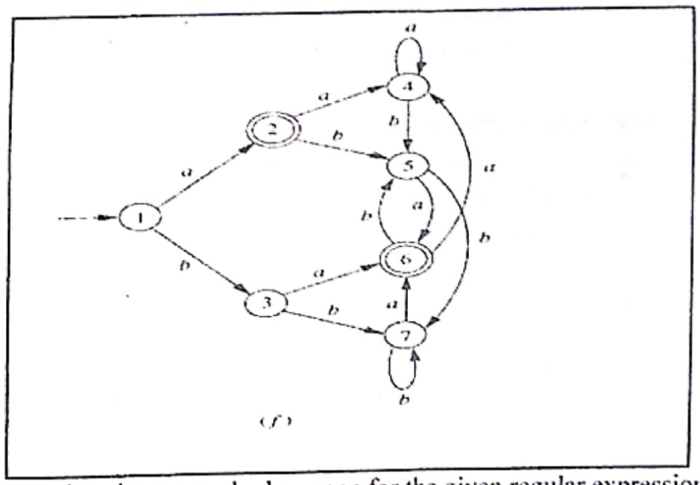
Time : 11:00 AM To 02:00 PM **Max Marks:** 100

Instructions:

IMP: Verify that you have received question paper with correct course, code, branch etc.

i) All questions are compulsory.
ii) Figure to the right indicates full marks.
iii) Assume suitable data wherever necessary.

		Marks	B.L	CO's
Q.1	**Attempt any two**	16		
A	Relate the following DFA with minimum state DFA using Minimization Techniques.		2	CO2



(f)

B	Translate into a regular language for the given regular expression		2	CO2
	i. (b ba)(a+b) *			
	ii. (0+1) *101(0+1) *			
	iii. (a+b)*(aa*bb*aa*+bb*aa*(a+b)*			
	iv. (ab+bb)*ba(a+b)*			
C	Define Keene's Theorem Part I and Part II and write proof of it.		1	CO1

Q.2 Attempt any two 16

A Solve the given grammar by removing the unit Productions & ∧ Null productions form the Given grammar:

S→A|B|BA | aB | bB |aa | bb | BaB | AbA

A→aA | ab | ba | aBB | bAA | ∧

B→bBB| aA | bAA| bB | ∧

B Define Deterministic finite automata (DFA), Non Deterministic Finite Automata (NFA) and Non Deterministic Finite Automata (NFA- ∧) with ∧ transition with its extended transition function& recursive definition for NFA-∧.

C Construct a DFA over an language Σ = {a, b} * for accepting a string ending with ***bba***

Q.3 Attempt any two 16

A Demonstrate a Turing machine for a string accepting$\{0^n 1^n | n \geq 1\}$ over an language Σ = {0,1} *

B Construct PDA which accepts Odd length Palindrome $\{WW^R | W = \{a, b\}^*\}$ Where, W is first half of string and W^R Reverse of string second half.

C Construct a Bottom -Up Parser for the grammar given below and show the working of Parser for the string **"a+a*a$"**

$S \rightarrow S_1\$$

$S_1 \rightarrow S_1+T \mid T$

$T \rightarrow T * a \mid a$

Q.4 Attempt any two 16

A Construct Turing Machine to Compute a function Copy of string for a Σ = {a, b} *

B Explain Turing Machine & Acceptance by a Turing Machine with example

C Construct the CFG (Context Free Grammar) from the PDA given in State Transition Table (STT) below.

Move Number	State	Input	Stack Symbol	Move(s)
1	q_0	a	Z_0	(q_3, XZ_0)
2	q_0	b	Z_0	(q_3, XZ_0)
3	q_0	a	X	(q_3, XX)
4	q_0	b	X	(q_3, XX)
5	q_0	c	X	(q_1, X)
6	q_0	c	Z_0	(q_1, Z_0)
7	q_1	a	X	(q_1, Λ)
8	q_1	b	X	(q_1, Λ)
9	q_1	Λ	Z_0	(q_2, Z_0)
(all other combinations)				none

Q.5	**Attempt any three**	**18**		
A	Show that a language $a^n b^n c^n, where\ n > 0$ is not a Context Free Language (CFL) using Pumping Lemma.		2	CO3
B	Explain a Recursively Enumerable Languages		2	CO4
C	Construct a Turing Machine to delete a symbol from the given input over Σ= {0, 1} *		3	CO4
D	Construct a PDA for balanced string of Parenthesis "{ { ( ) }}"		2	CO3
Q.6	**Attempt any three**	**18**		
A	Describe Pumping Lemma for Context Free Languages(CFL) with Example		2	CO3
B	Construct Turing Machine (TM) which computes a function $f(x) = 2x$, where x is unary number 1		3	CO4
C	Explain UTM(Universal Turing Machines) with Encoding function		2	CO4
D	Illustrate intersection & complement of two Context Free Language (CFL) is not a Context Free Language (CFL)		2	CO3

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S.Y.B.Tech. (Computer Science & Engineering)

(Semester- IV)

END SEMESTER EXAMINATION, MAY- 2022

Course Code: UCSE0401

Course Name: Automata Theory

Day and Date: Tuesday, 24-May-22 **PRN:**

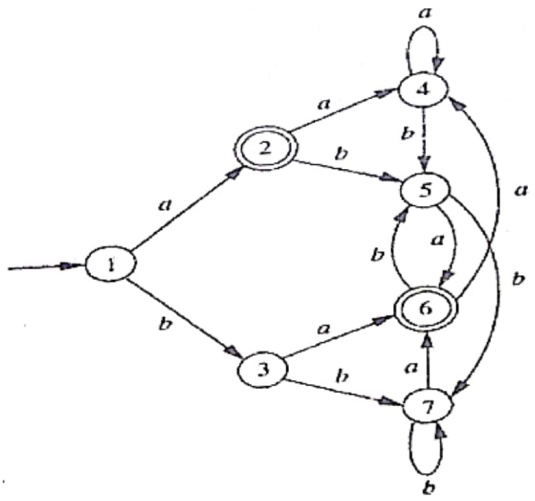
Time: 09:30 AM To 12:30 PM **Max Marks:** 100

Instructions:

IMP: Verify that you have received question paper with correct course, code, branchetc.

i) All questions are compulsory.
ii) Figure to the right indicates full marks.
iii) Assume suitable data wherever necessary.

		Marks	B.L.	CO's
Q.1	**Attempt any Two**	16		
A	Convert the following grammar into CNF: S→ABA | aB | bB |aa | bb | BaB | AbA A→aA | ab | ba | aBB | bAA | a B→bB| ba| b		2	CO2
B	Minimize the following DFA with minimum state with steps.		2	CO1



(f)

Define Ambiguous Grammar? Check whether the given grammar is Ambiguous grammar by generating the string "((***id*id***)−(***id/id***))"the grammar given by, 1 CO

$E \rightarrow (E)$,

$E \rightarrow E + E$,

$E \rightarrow E - E$,

$E \rightarrow E * E$,

$E \rightarrow E/E$,

$E \rightarrow id$

Q2 Attempt any two **16**

Q1 Design DFA for string containing ***ab*** or ***bba*** over a ∑ = {a, b} * and also parse the string "***aaaabbbabbabbab***". 3 CO

Q2 Remove the Λ productions and unit productions from the given grammar's. 2 CO

i. S→ABC|BaB, A→aA|BaC|aaa|Λ, B→bBb|a|Λ, C→CA|AC|b|c

ii. S→ AaA | CA |BaB , A→ aaBa | CDA |aa , B→ bB | baB | bb |aS , C → Ca |bC |D| Λ, D → bD | Λ

Q3 Write a language for the given regular expression 2 CO

i. (b+(b*ab*ab*))*

ii. (0+1)*101(0+1)*

iii. (a+b)*(aa*bb*aa*+bb*aa*)(a+b)*

iv. (aab+bbaba)*baba

Q3 Attempt any two **16**

Q3 1 Draw a Turing Machine to copy Strings function over a ∑= {a, b} * 3 CO

2 Construct PDA which accept Odd length Palindrome {WW^R| W = {a,b}*} Where, W first half of string and W^R Reverse in second half. 3 CO

3 CO

Move Number	State	Input	Stack Symbol	Move(s)
1	q_0	a	Z_0	(q_0, XZ_0)
2	q_0	b	Z_0	(q_0, XZ_0)
3	q_0	a	X	(q_0, XX)
4	q_0	b	X	(q_0, XX)
5	q_0	c	X	(q_1, X)
6	q_0	c	Z_0	(q_1, Z_0)
7	q_1	a	X	(q_1, Λ)
8	q_1	b	X	(q_1, Λ)
9	q_1	Λ	Z_0	(q_2, Z_0)
(all other combinations)				none

3 Construct the CFG (Context Free Grammar) from the PDA given in State Transition Table (STT) above

Q4	**Attempt any two**	**16**		
1	Construct a Bottom -Up Parser for the grammar given below and show the working of Parser for the string **"a+a*a$"** $S \rightarrow S_1\$$ $S_1 \rightarrow S_1+T \mid T$ $T \rightarrow T * a \mid a$		3	CO3
2	Design a Turing Machine to Compute a function Reverse of string for both odd length and even length over a $\sum = \{a, b\}$ *		3	CO3
3	Design a Turing Machine to delete a symbol from the given input over $\sum = \{a,b\}$ *		3	CO3
Q5	**Attempt any three**	**18**		
1	Write a short note on Top-Down Parsing & Bottom-Up Parsing with example?		2	CO4
2	Describe Turing Machine & Acceptance by a Turing Machine		2	CO4
3	Show that a language $a^n b^n c^n, where n > 0$ is not a Context Free Language (CFL) using Pumping Lemma		2	CO4
4	Write a note on Universal Turing Machine (UTM)?		2	CO4
Q6	**Attempt any three**	**18**		
1	Design a Turing Machine for Reminder function (N Mod 2), where N is Binary Number.		3	CO3
2	If L_1, L_2 and L_3 given below are context free languages show that $L_1 \cap L_2 \cap L_3$ is not context free language. $L_1 = \{ a^i b^j c^k \mid i \leq j \}$, $L_2 = \{ a^i b^j c^k \mid j \leq k \}$ and $L_3 = \{ a^i b^j c^k \mid k \leq i \}$		2	CO3
3	Draw a Turing Machine (TM) which accepts a language $\{ a^n b^n \mid n \geq 0 \}$		2	CO3
4	Design a PDA which accept a language $L = \{x \in \{a,b\}^* \mid n_b(x) > n_a(x)\}$ where $n_a(x)$ is the number of a's in string x and $n_b(x)$ is the number of b's in string x		3	CO3

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Exam. Cell

D.S.Y. B.Tech. (Computer Science & Engineering)
(Semester- IV)
END SEMESTER EXAMINATION, AUGUST- 2022

Course Code : UCSE0404

Course Name : Computer Organization and Architecture

Day and Date : Saturday , 06/08/2022. **PRN :** 2122010064

Time : 11:00 AM To 02:00 PM **Max Marks:** 100

Instructions:

IMP: Verify that you have received question paper with correct course, code, branch etc.

i) All questions are compulsory.
ii) Figure to the right indicate full marks.
iii) Assume suitable data wherever necessary.

		Marks	B.L	CO's
Q.1	**Attempt any two**	16		
A	Explain I type, J type and R type instructions.		2	CO2
B	Draw and explain architecture of accumulator based CPU		3	CO2
C	Design 2's complement multiplier using classical method.		3	CO3
Q.2	**Attempt any two**	16		
A	Differentiate between RISC and CISC		2	CO2
B	With neat diagram,Explain Wilkes basic structure of a micro programmed control unit		2	CO2
C	Explain User mode and supervisor modes of processors		2	CO1
Q.3	**Attempt any two**	16		
A	Draw and explain structure of associative memory cell.		2	CO4
B	Explain with example working of non preemptive memory allocation algorithms.		2	CO4
C	Draw a structure of linear pipeline and explain its function		3	CO5

Q.4	**Attempt any two**	**16**		
A	Explain types of Associative array processors with neat diagram		2	CO5
B	Explain Direct mapping in Cache memory with example.		3	CO4
C	With neat diagram, Explain steps for intercluster communications in cm* architecture		3	CO5
Q.5	**Attempt any three**	**18**		
A	Explain C Access memory interleaving with neat diagram.		3	CO4
B	Explain working of Associative memory processor with diagram.		2	CO4
C	Explain Different levels of memory hierarchy.		2	CO4
D	Differentiate between Static memory and Dynamic memory		2	CO5
Q.6	**Attempt any three**	**18**		
A	How address translation is done in Slocal of Cm* system		3	CO5
B	Describe the types of pipeline processors		2	CO5
C	Explain SIMD and MIMD Flynn's parallel processor architectures		2	CO4
D	Draw a structure of linear pipeline and explain its function		2	CO5

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S.Y. B.Tech. (Computer Science & Engineering)

(Semester- IV)

END SEMESTER EXAMINATION, MAY- 2022

Course Code : UCSE0404

Course Name : Computer Organization and Architecture

Day and Date : Tuesday , 31-May-22

Time : 09:30 AM To 12:30 PM

PRN : 2021000492

Max Marks: 100

Instructions:

IMP: Verify that you have received question paper with correct course, code, branch etc.

i) All questions are compulsory.
ii) Figure to the right indicate full marks.
iii) Assume suitable data wherever necessary.

		Marks	B.L	CO's
Q.1	**Attempt any two**	16		
A	Illustrate the IEEE754 floating point number representation. Calculate and represent (- 11.035) number in single precision		3	1
B	Explain GCD control unit design using classical method in detail		2	2
C	Design Multiplier control unit using the micro programmed approach. Use encoding by function method for specifying control signals		2	2
Q.2	**Attempt any two**	16		
A	Write a program using zero address instruction format for: C= (Ax B)-(CxD)xE		3	1
B	Draw all NAND circuit for one hot multipliers control unit		2	2
C	Differentiate vertical and horizontal microinstruction format		2	2
Q.3	**Attempt any two**	16		
A	How 2 processors in same cluster communicate with each other, in Cm* architecture		2	5
B	Explain the function of tightly coupled multiprocessor system		2	5
C	Discuss the role communication memory in multiprocessor system		2	5

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Q.4 Attempt any two 16

A	Explain the performance measures used in pipeline computers	2	5
B	List and explain types of pipelined processor	2	5
C	Given a 3-stage pipeline processor, calculate the efficiency and throughput for 75 instructions with clock frequency 2.5MHz	3	3

$e = \frac{k \times n}{k + (n-1)}$

$\gamma = ex f$

Q.5 Attempt any three 18

A Demonstrate the working of first fit and best fit memory allocation for the blocks K5(225) and K6(450). Total capacity of memory is 2.5K words. 3 4

Available space list:

Address	Size
0	200
500	300
1250	500
2300	260

Occupied space list:

Address	Size
200	300
800	200
1000	250
1750	550

B	Draw the structure of 2-D RAM and explain its function	2	4
C	Explain the look through cache organization in detail	2	4
D	Calculate hit ratio H for (M1,M2) where $t_{A1}=10^{-8}$ and $t_{A2}=10^{-3}$ with access efficiency of 65 %	3	3

Q.6 Attempt any three 18

A	Compare Loosely Coupled & Tightly Coupled Architecture	2	5
B	Explain Flynn's classification of parallel processor	2	5
C	Write Short note on associative addressing	2	4
D	Design a 6K x 64-bit RAM using 2K x 64-bit RAM IC	3	4

DK270

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Exam. Cell

D.S.Y. B.Tech. (Computer Science & Engineering)

(Semester- IV)

END SEMESTER EXAMINATION, AUGUST- 2022

Course Code : UCSE0402

Course Name : Computer Graphics

Day and Date : Tuesday , 02-Aug-2022 **PRN :** 2122010064

Time : 11:00 AM To 02:00 PM **Max Marks:** 100

Instructions:

IMP: Verify that you have received question paper with correct course, code, branch etc.

i) All questions are compulsory.
ii) Figure to the right indicate full marks.
iii) Assume suitable data wherever necessary.

		Marks	B.L	CO's
Q.1	**Attempt any two**	16		
A	Explain the flat-panel display in details	8	2	CO1
B	Plot a circle using Bresenhams algorithm whose radius is 8 and center coordinates are (0,0) .	8	3	CO2
C	Discuss about RLE with example.	8	2	CO2
Q.2	**Attempt any two**	16		
A	Explain in detail Affine and Perspective Geometry	8	2	CO2
B	Describe the seed fill algorithm for scan converting polygon	8	1	CO1
C	Show that two successive reflections about either of the coordinate axis is equivalent to a single rotation about the coordinate origin.	8	3	CO2
Q.3	**Attempt any two**	16		
A	Demonstrate the window to viewport transformation with example.	8	3	CO3
B	Given a Bezier curve with 4 control points B_0 [1 0], B_1[3 3], B_2[6 3], B_3[8 1]. Determine any 5 points laying on the curve .Draw a rough sketch of the curve.	8	3	CO3
C	Explain End point coding algorithm with example	8	2	CO2

Q.4	**Attempt any two**	**16**		
A	Explain Cohen Sutherland line clipping algorithm with example	8	2	CO3
B	Explain the parametric and non-parametric curves	8	2	CO3
C	Describe B-spline curve and its properties with example	8	2	CO3
Q.5	**Attempt any three.**	**18**		
A	Illustrate specular reflection model for calculating surface intensity at given point.	6	2	CO4
B	Differentiate Bezier curve and B-Spline curve.	6	4	CO3
C	Expline Diffuse Reflection in detail.	6	2	CO4
D	State Anti-Aliasing Techniques	6	2	CO2
Q.6	**Attempt any three**	**18**		
A	Define Bezier Curve	6	1	CO3
B	Illustrate Window to viewport transformation	6	3	CO2
C	Recall Warn Model	6	1	CO4
D	Explain Z-Buffer Algorithm in detail.	6	2	CO3

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KOLHAPUR INSTITUTE OF TECHNOLOGY'S,
COLLEGE OF ENGINEERING (AUTONOMOUS), KOLHAPUR
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Exam. Cell

T.Y.B.Tech. (Computer Science & Engineering)
(Semester- V)
END SEMESTER EXAMINATION, DECEMBER- 2022

Course Code : UCSE0501

Course Name : Computer Algorithm

Day and Date : Thursday, 22-Dec-22

Time : 09:30 AM To 12:30 PM

PRN : 2122010064

Max Marks: 100

Instructions:

IMP: Verify that you have received question paper with correct course, code, branch etc.

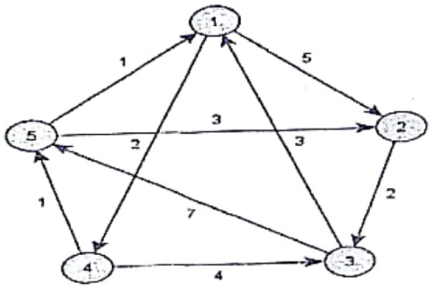
i) All questions are compulsory.
ii) Figure to the right indicate full marks.
iii) Assume suitable data wherever necessary.

		Marks	B.L	CO's
Q.1	**Attempt any two**	**16**		
A	Explain Binary search algorithm and prove that it's complexity is o(log n)	8	3	2
B	Analyze Worst case , Best Case and Average case complexity of Merge Sort	8	3	1
C	Explain Big 'O', Big -Ω ,Θ notations with the help of example.	8	2	1
Q.2	**Attempt any two**	**16**		
A	Apply quick sort to following set of unsorted array. Prove that the complexity of quick sort is $O(n^2)$ in worst case. Given set = {9,7,5,11,12,2,14,3,10,6}	8	3	3
B	Solve the following recurrence relation 1. $T(n) = 3T(n/2) + n$ 2. $T(n)= 3T(n/2)+n^2$ Using Master theorem/ Back substitution /Recurrence tree method	8	3	1
C	Define Recursive algorithm with an example. Compare recursive algorithm with iterative algorithm with the help of an example.	8	1	1
Q.3	**Attempt any two**	**16**		
A	Differentiate between optimal solution and feasible solution with the help of an example.	8	2	2
B	What is the solution generated by greedy solution to job sequencing with deadline problem when n=7 (P1,...P7)=(3,5,20,18,1,6,30) (d1..d7)=(1,3,4,3,2,1,2)	8	3	3

C Apply Greedy method to solve following fractional knapsack problem. Consider 5 items with their respective weights and values, *w=<5,10,20,30,40> and v=<30,20,100,90,160>*. The capacity of knapsack *W=60*.Find solution using Greedy Method to fractional knapsack. 9 3 2

Q.4 Attempt any two 16

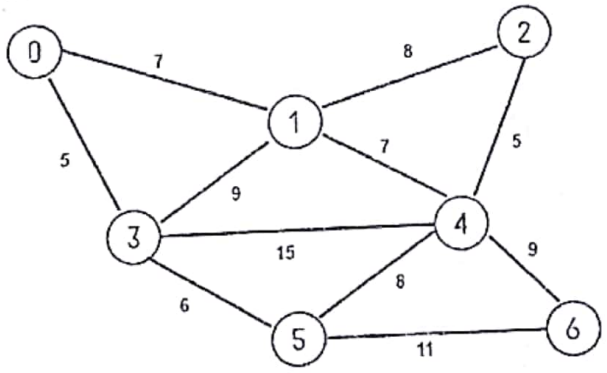
A 8 3 3



Solve above graph example using Floyd Warshall's all pair shortest path algorithm.

B Obtain a set of optimal Huffman codes for 7 messages (m1....m7) with relative frequencies are (q1...q7) = (4,5,7,8,10,12,20).Draw decode tree for this set of codes . 8 5 2

C 8 3 3



Apply prims's algorithm for the above graph, discuss the algorithm with analysis and applications

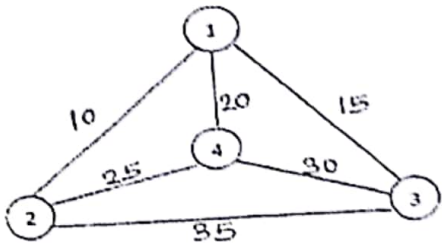
Q.5 Attempt any three 18

A 6 3 3

Sr. No	0	1	2
Keys	10	12	20
Access Time (Frequency)	34	8	50

Solve following optimal BST problem using dynamic programming method

B Solve the given problem to find tour of shortest path in Travelling Salesperson problem using dynamic programming. Discuss algorithm. 6 3 3



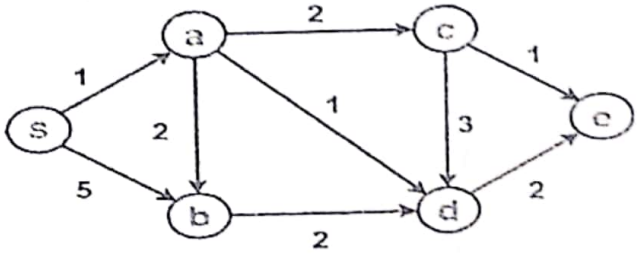
C Apply dynamic programming for the following 0/1 knapsack problem. 6 3 3

Weight = {1,3,4,5}

Profit ={1,4,5,7}

Max capacity= 7 , n=4

D 6 3 3



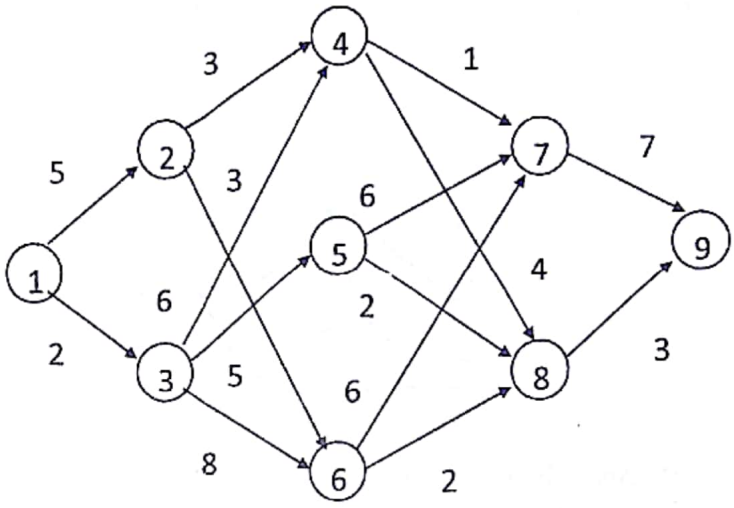
Solve given graph problem using Dijkstra's Single source shortest path algorithm.

Q.6 Attempt any three 18

A What are NP, P, NP-complete and NP-Hard problems? 6 1 3

B Solve graph coloring problem for n=4 (nodes) and m=3 (color) using backtracking. Explain using state space search tree. 6 3 3

C

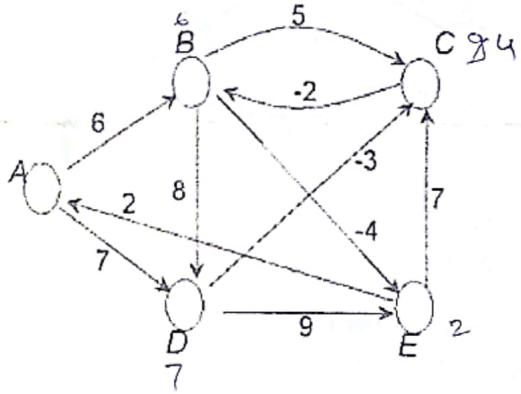


6

1 3

Find minimum cost of path from S-T is the multistage graph of following figure. Use both forward and backward reference method

D



6 3 2

Apply Bellman Ford algorithm to solve the above graph problem

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