(62)

Total no of pages : 2

Roll no :.....
BE (COE) Fifth Semester

B.E. END SEMESTER EXAMINATION, NOV 2015
COE - 302 : DMDA (Discrete Mathematics and Design of Algorithms)

Time : 3:00 Hrs.

Max Marks: 70

Note : Attempt any five questions. Assume suitable missing data, if any.

Q.1.(a). Find whether the given formulas are tautology, contingency and contradiction using rules and verify using truth tables.

(i) $\sim(A \rightarrow B) \vee (\sim A \vee (A \wedge B))$

(ii) $(H \rightarrow (I \wedge J)) \rightarrow \sim(H \rightarrow I)$

[4]

Q.1.(b). Show that the set of real numbers between 0 and 1 is not countably infinite set. [5]

Q.1.©. What is a predicate ? How do you define any formula in predicate calculus ? Give suitable examples. [5]

Q.2.(a). State the job sequencing problem with deadlines. Describe the greedy method to obtain an optimal solution to this problem. Find the solution using greedy method when $n = 7$,

$(p1,p2,p3,p4,p5,p6,p7) = (5, 7, 22, 20, 4, 9, 36)$ and
$(d1,d2,d3,d4,d5,d6,d7) = (2,4,5,3,2,3,4)$

[7]

Q.2.(b). What is lexicographic order? Give algorithm to generate permutation in lexicographic order. Generate all the permutations in lexicographic order of 4 objects {6,7,8,9}. [7]

Q.3.(a). Explain the various methods of solving a given recurrence relation. Solve the given recurrence relation when $a_0 = 0$ and $a_1 = 1$

$$a_r - 7a_{r-1} + 10a_{r-2} = 3^r$$

[7]

Q.3.(b). Explain divide and conquer strategy used to solve any given problem. Explain quick sort algorithm. Give suitable example and analyze its complexity. [7]

Q.4.(a). What is a relation? Suppose the relation R on { 1,2,3 } is defined as R = { (1,1), (1,2), (2,1), (2,2), (2,3), (3,2), (3,3)}. Give various representations of this relation. Hence determine whether this relation is equivalence relation or partial ordering relation. [7]

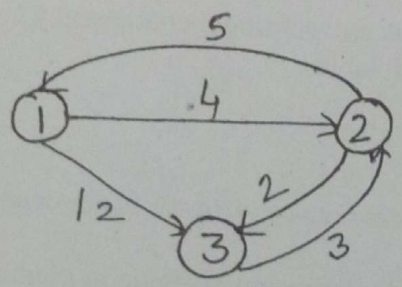
Q.4.(b). Describe the multistage graph problem using forward approach. Give algorithm and apply it on suitable example. [7]

Q.4.(b). Give algorithm for multiplying two matrices using stressen's method . How it is different from conventional matrix multiplication method? Multiply the given matrices using stressen,s method of multiplication.

$$A = \begin{matrix} 2 & 3 & 4 & 1 \\ 1 & 2 & 3 & 2 \\ 4 & 2 & 1 & 1 \\ 3 & 4 & 1 & 2 \end{matrix} \qquad B = \begin{matrix} 2 & 1 & 3 & 1 \\ 1 & 2 & 4 & 5 \\ 3 & 1 & 3 & 2 \\ 2 & 3 & 2 & 3 \end{matrix}$$

[7]

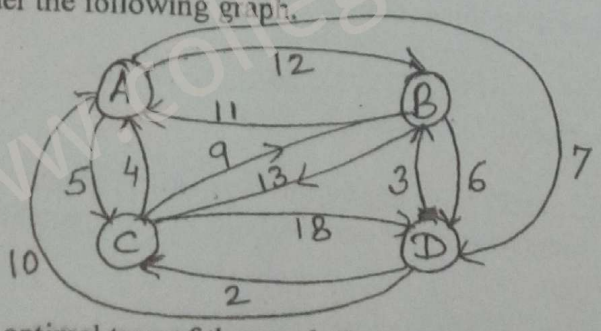
Q.5.(a). Illustrate all pair shortest path algorithm. Apply it on the given graph



[8]

Q.5.(b). Find the optimal placement for 13 programs on three tapes T0, T1, T2 where the programs are lengths 12, 5, 8, 32, 7, 5, 18, 26, 4, 3 11, 10 and 6. [6]

Q.6.(a). Consider the following graph.



Find an optimal tour of the graph that starts at A and goes through the other nodes and terminate at A, using dynamic programming approach. [8]

Q.6.(b).What are Huffman codes? Give algorithm. Also explain it using suitable example. [6]

Q.7. Explain in detail with examples (any four)

(i) Lattice
(ii) Composition of relations and functions
(iii) Characteristic functions and its properties
(iv) Knapsack problem
(v) Asymptotic notations
(vi) Principle CNF and DNF

[3.5 x 4]

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Fifth Semester

Roll no : .....
BE (COE)

END SEMESTER EXAMINATION, NOVEMBER – 2012

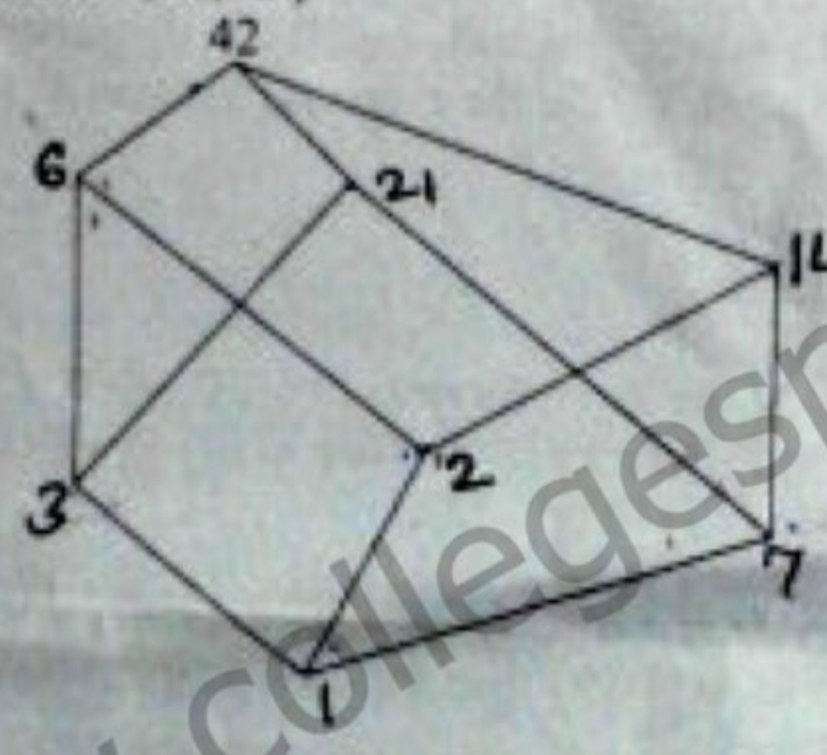
COE – 302 : DISCRETE MATHEMATICS AND DESIGN OF ALGORITHMS
(DMDA)

Time : 3 Hrs.

Max Marks : 70

Note : Answer any five questions. Do all the parts of same question at one place. Assume suitable missing data, if any.

Q.1(a). Define lattice. Prove that the given figure is a lattice or not where
D = { 1,2,3,6,7,14,21,42 }

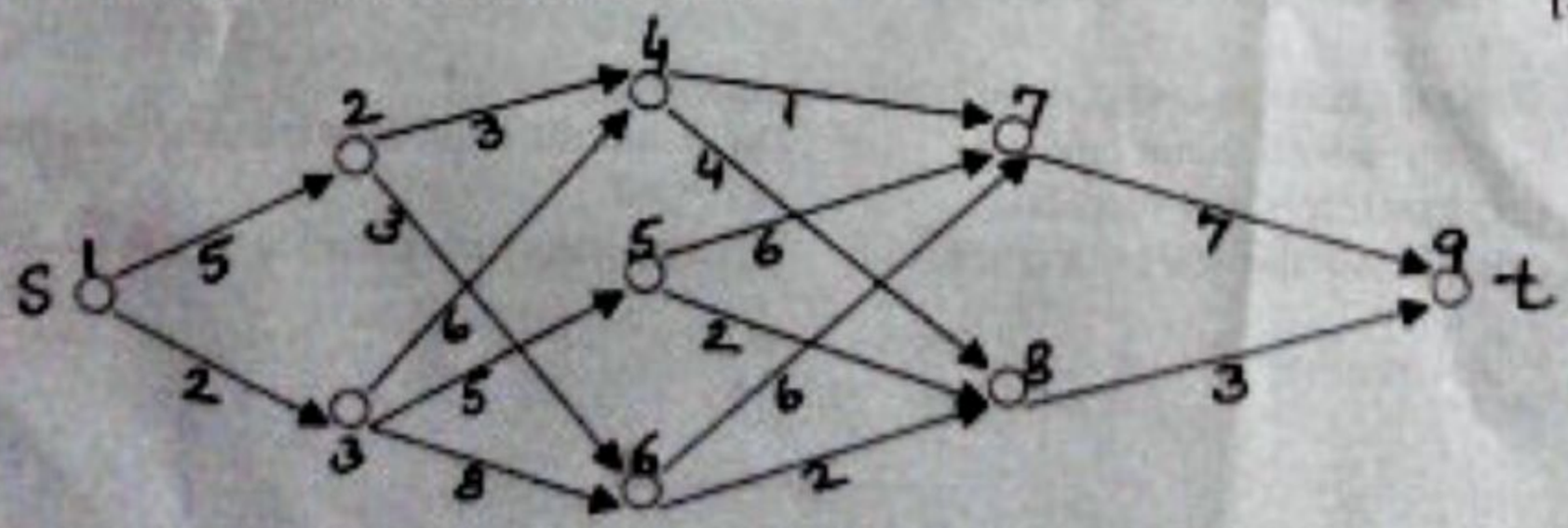


[4]

Q.1(b). What is lexicographic order. Give the algorithm for generating combinations in lexicographic order. Generate combinations in lexicographic order when four objects are selected from the set { 4,5,6,7,8,9}. Also find the number of different outcomes when 3 dices are rolled with repetition of numbers. [5+3+2]

Q.2(a). Differentiate between dynamic programming and greedy strategy using knapsack problem. Give suitable example. [4]

Q.2(b). Find the minimum cost path from s to t in the multistage graph in the figure. Do this first using the forward approach and then using the backward approach. Write the algorithms in both the cases. [5+5]



Q.3(a). What is a partition ? Let A = { l,m,n,o,p,q,r,s,t,u,v} and
Π1 = { lmn, opqr, st, uv}
Π2 = {lm, nuv, ot, prs, q }
Define and find sum and product of Π1 and Π2. [4]

Q.3(b). What is a function ? Determine the following whether it is *one-to-one, onto* or both.

f : I -> I

f(j) = j/2 when j is even

and

f(j)= (j-1)/2 when j is odd [5]

Q.3(c). Demonstrate that R is a valid inference from the premises P->Q, Q-> R and P. Give the rules used. [5]

Q.4(a). Define well formed formula in predicate calculus. Write the predicate formula for " X is the father of the mother of Y " for the given predicates

P(x) : x is a person

F(x ,y) : x is the father of y and

M(x ,y) : x is the mother of y [4]

Q.4(b). Find the PCNF and PDNF of the given formula ((~ P) -> R) /\ (Q <-> P)) using method for converting PCNF to PDNF. Then verify it with the results obtained using truth tables. [5+5]

Q. 5(a). Describe the strassen's divide and conquer strategy to compute the product of two nxn matrices. Is this method faster than the conventional method of multiplication of two matrices. [4]

Q.5(b). State and analyse the job sequencing problem with deadlines. Describe the greedy method to obtain an optimal solution to this problem . What is the solution generated by greedy method when n = 7, {p1,.....p7} = { 5, 7, 22, 20, 3 , 8, 32 } and {d1,.....d7} = { 2, 4, 5, 4, 3, 2, 3 }. [5+5]

Q.6(a). Solve the following recurrence relation

$T(n) = 7\,T(n/2) + n^2$ [4]

Q.6(b). Describe the greedy methods used for solving any particular problem. How you will find Huffman's code using Greedy method. Write the algorithm and give suitable example for generating Huffman's codes. [5+5]

Q.7 Write short notes and give suitable examples [any four]

(a) Asymptotic notations.
(b) Composition of relations and functions.
(c) Quantifiers and predicates
(d) POSET
(e) All pair shortest path algorithm.
(f) Minimum cost spanning tree algorithms

[3.5 x 4]

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FIFTH SEMESTER **B.E.(COE**

END SEMESTER EXAMINATION ***NOVEMBER-2010***

COE-302 DISCRETE MATHEMATICS & DESIGN OF ALGORITHMS

Time: 3 Hour ***Max. Marks : 70***

Note : Answer any ***FIVE*** questions.
Assume suitable missing data, if any.

1[a] Show the following implication without constructing the truth table:

$(P \vee (Q \wedge R)) \overleftarrow{\rightarrow} ((P \vee Q) \wedge (P \vee R))$

$(P \overrightarrow{\leftarrow} Q) \Leftrightarrow (P \vee Q) \wedge \neg (P \wedge Q)$ 8

[b] What is a predicate? How do you define any formula in predicate calculus? State the following argument in symbolic form and test its validity.

"If the parcel is not properly addressed or is too large, then the post office will not accept it. The parcel is not too large. If chou wrote the address on the parcel, then it is properly addressed. Hence if chou wrote the address, the post office will accept the parcel". 6

2[a] What is pigeon hole principle? Apply this principle, show that if any 26 people are selected, then we may choose a subset of 4 so that all 4 were born on the same day of the week. 5

[b] Solve the recurrence relation $a_r - 7a_{r-1} + 10a_{r-2} = 3^r$ given that $a_0 = 0,\ a_1 = 1$. 5

[c] Let $X = \{1,2,3,4\}$ a function is defined as $f : X \to X$ such that $f \neq I_x$ and is one –to-one. Find $fof = f^2$ and f^{-1}. 4

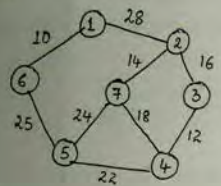
3[a] Define the cardinality of a set. Show that the set of real numbers between 0 and 1 is not a countably infinite set. 5

[b] Generate permutations in lexicographic order of 4 subjects {4,5,6,7}. Find the number of different outcomes when 3 dice are rolled with repetition of numbers. 5

[c] Symbolize the following statement using proposition and prove its validity: 4
If a graduate is well qualified, he will get a good job. A graduate is not well qualified. Therefore, he will not get good job.

B.E.(COE)

...erate the minimum cost spanning tree for the following graph using Prim's and Kruskal's algorithms. **10**



[b] Multiply the following two matrices using strassen's method

$$A=\begin{bmatrix}2&3&4&1\\1&2&3&2\\4&2&1&1\\7&6&2&1\end{bmatrix} \qquad B=\begin{bmatrix}2&1&3&1\\1&2&4&5\\3&1&3&2\\2&3&2&3\end{bmatrix}$$ **4**

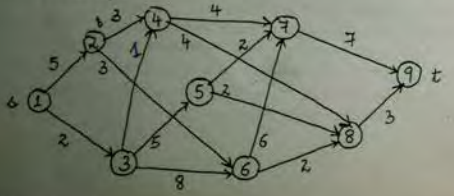
5[a] Given a sequence *(A1, A2, A3, A4)* of *4* matrices to be multiplied. In how many ways the product *A1.A2.A3.A4* can be fully parenthesized? Parenthesize the sequence so that the no. of scalar multiplication is minimum. The dimensions are given below

A_1	5×4
A_2	4×2
A_3	2×3
A_4	3×6

10

OR

Find the minimum cost path from *s* to *t* in the multistage graph in the figure. Do this first using forward approach and then using backward approach write the algorithm in both the cases.

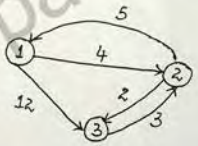


[b] Greedy approach guarantees to produce optimal solution. True or False? Write your comments. **4**

6[a] State the job sequencing problem with deadlines. Describe the greedy method to obtain an optimal solution to this problem. What is the solution generated by greedy method when $n=7, (p_1,p_2 \ldots\ldots p_7)=(5,7,22,20,3,8,32)$ and $(d_1,d_2 \ldots\ldots d_7)=(2,4,5,4,3,2,3)$ **7**

[b] State and analyze the travelling salesman problem. Describe how dynamic programming solution can be obtained to solve this problem. **7**

7[a] Illustrate all pairs shortest paths algorithm with the example given as follows: **7**



[b] Differentiate between dynamic programming and greedy strategy using knapsack problem. Analyze the algorithms using both the approaches. **7**