B.Tech Odd Semester (CBCS) Exam.,
December—2016

COMPUTER SCIENCE AND ENGINEERING

(3rd Semester)

Course No. : CSECC–02

(Discrete Mathematics and Graph Theory)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

Note :
1. Attempt *any* **five** questions.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the margin indicate full marks for the questions.

1. *(a)* Define the following with examples : 2×3=6

(i) Binary relation

(ii) Surjective functions

(iii) Bijective functions

(b) Define by induction a set of well-formed strings of parenthesis. 4

2. *(a)* Write the steps of consensus method for finding the prime implicants. 4

(b) Let $E \quad xy \quad y\,t \quad x\,yz \quad xy\,t$ be a Boolean expression, find the prime implicants and minimal sum of E. 3+3=6

3. *(a)* Prove the validity of the following propositional statement : 4

$$P \quad Q,\ Q \quad R \mid P \quad R$$

(Law of syllogism)

(b) Define the two quantifiers used in propositional logic. Verify the correctness of the following statement : 2+4=6

$$(p \quad q) \quad (\quad p \quad q) \qquad p$$

4. *(a)* Using truth table, prove the logical equivalence of

$$p \quad (q \quad r) \quad (p \quad q) \quad (p \quad r)$$ 4

(b) Let the w.f.f. f be $(a \quad b) \quad (\quad a \qquad b)$, find the CNF and DNF of f. 6

5. *(a)* What is a graph? Define the following terms with the help of suitable examples : 1+4=5

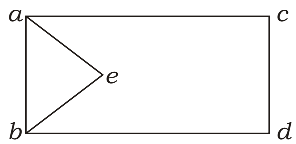
(i) Incidence

(ii) Degree

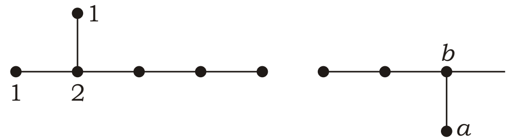
(iii) Isolate

(b) Prove that the sum of degree of all vertices in graph G is twice the number of edges. 4

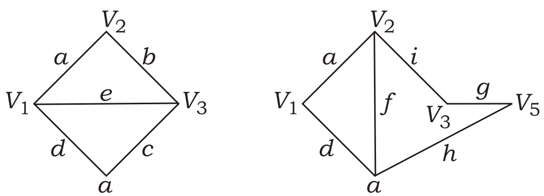
(c) Find the complement of the following graph : 1



6. (a) What do you mean by isomorphic graph? Whether the following graphs are isomorphic or not? Justify your answer : 2+2=4



(b) What are the set theoretic operations that can be employed on a graph? Implement the operations on the given graphs : 6



7. (a) What are eccentricity and centre in a tree? Give example. Show that each tree has one or two centres. 3+4=7

(b) Define spanning tree, rank and nullity with a suitable example of each. 3

8. (a) What is connectivity in a graph? Prove that edge connectivity of a connected graph G cannot exceed the degree of the vertex v, vertex v has the smallest degree in G. 2+4=6

(b) What is backtracking? Write an algorithm to search a spanning tree from a graph which implements backtracking. 1+3=4

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