

Total No. of Questions : 10] | Total No. of Printed Pages : 4

Roll No.

CS/EI/IT-405(O)

B. E. (Fourth Semester) EXAMINATION, Dec., 2009

(Old Scheme)

(Common for CS, EI & IT Engg.)

DISCRETE STRUCTURE

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt *one* question from each Unit. All questions carry equal marks.

Unit – I

1. (a) Explain countable set and uncountable set with example. 10
- (b) Prove that : 10

$$(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$$

Or

2. (a) Show that $n^3 + 2n$ is divisible by 3. 10
- (b) Show that the relation

$$R = \{(a, b) : a - b = \text{even integer}\}$$

i. e. $a R b \Leftrightarrow a - b = \text{even integer and } a, b \in I \text{ is an equivalence relation } \}$. 10

Unit – II

3. Consider the FSM in the table given ahead. Find the equivalent classes and construct the reduced machine : 20

P. T. O.

Present State	Next State		Output	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
A	F	C	0	0
B	E	G	1	0
C	F	B	1	1
D	G	E	0	1
E	B	D	1	0
F	G	F	0	0
G	D	B	1	1
H	E	B	1	0

Or

4. (a) Construct the truth table

$$(p \wedge q \Rightarrow r) \Leftrightarrow [(p \Rightarrow r) \vee (q \Rightarrow r)]. \quad 10$$

- (b) Express $\sim (p \vee q) \Leftrightarrow (p \wedge q)$ in conjunctive normal forms. 10

Unit – III

5. Define minimum spanning tree and find the minimum spanning tree of the following graph : 20

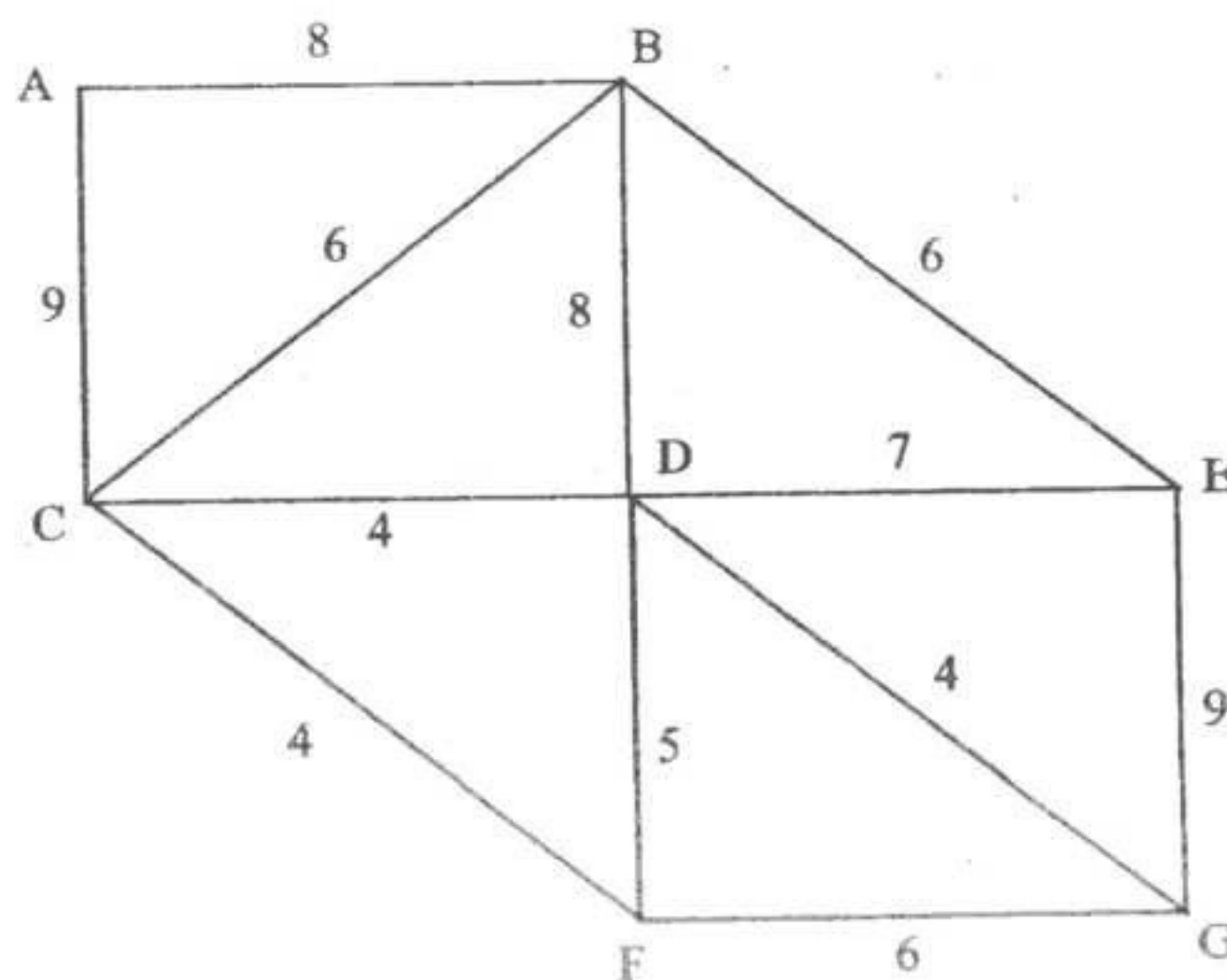


Fig. 1

Or

6. Find the shortest path using Dijkstra's algorithm. 20

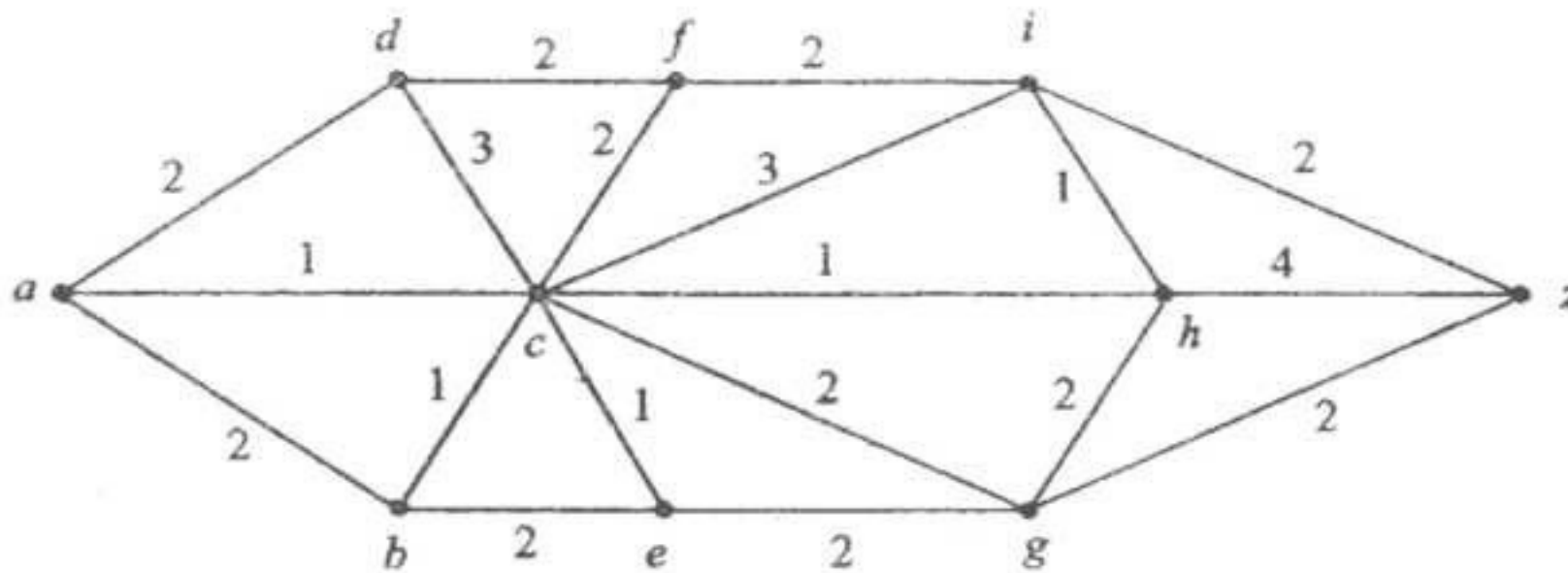


Fig. 2

Unit – IV

7. (a) What is the solution of the recurrence relation : 10

$$a_n = a_{n-1} + 2a_{n-2}$$

with $a_0 = 2$ and $a_1 = 7$?

- (b) Find the generating function of the following numeric function : 10

$$a_r = 3^{r+2}, \quad r \geq 0$$

Or

8. (a) Solve the difference equation : 10

$$a_r - a_{r-1} = 7$$

- (b) Solve the recurrence relation : 10

$$a_r - 7a_{r-1} + 10a_{r-2} = 0$$

Unit – V

9. Write short notes on the following : 5 each

- (i) Group
- (ii) Isomorphism
- (iii) Normal subgroup
- (iv) Ring

P. T. O.

Or

10. (a) Let $(\{a, b\}, *)$ be a semigroup where $a * a = b$. Show that : 10

(i) $a * b = b * a$

(ii) $b * b = b$

(b) What is Semigroup ? Prove that $(A, +)$ is a semigroup where A be the set of all positive even integers and $+$ be the ordinary addition operation. 10