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. $a R b \Leftrightarrow a - b =$ even integer and $a, b \in I$ 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
$(p \wedge q \Rightarrow r) \Leftrightarrow [(p \Rightarrow r) \vee (q \Rightarrow r)]$. 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

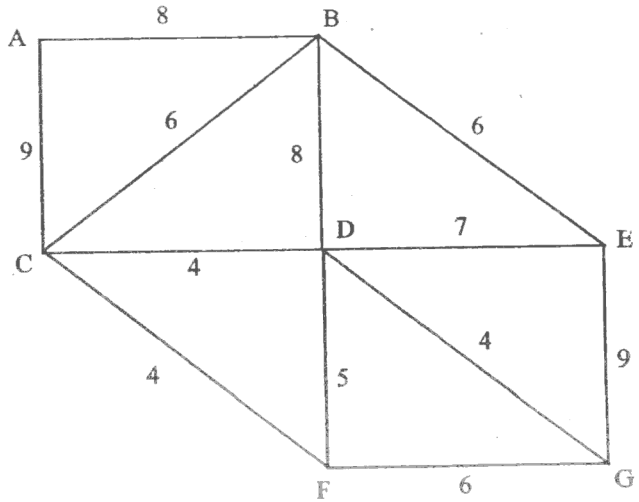

Fig. 1

Or

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

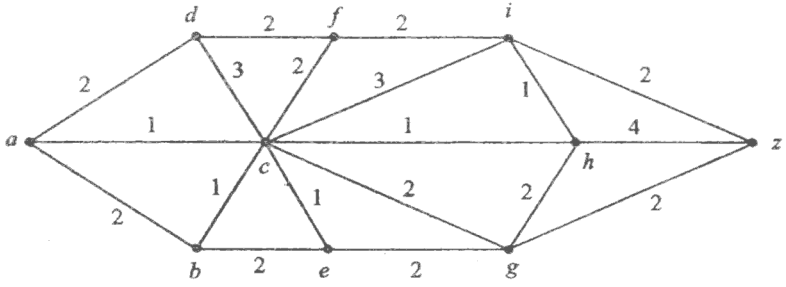

Fig. 2

Unit – IV

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

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

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

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

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

Or

8. (a) Solve the difference equation : 10

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

(b) Solve the recurrence relation : 10

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

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