

QUESTION 2016

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

i) Solution of the recurrence relation $a_n = 2a_{n-1}$ with $a_0 = 1$ is

✓a) 2^n

b) 2^{n-1}

c) 2^{n+1}

d) 2^{n-2}

ii) If the truth value of p and q are F and T respectively then the truth value of $p \leftrightarrow q$ is

a) T

✓b) F

c) both T and F

d) none of these

iii) A grammar is said to be regular if it is of

a) Type-0

b) Type-1

c) Type-2

✓d) Type-3

BCA MC-104

iv) $p \vee (p \wedge q) \equiv$
☒ a) p

b) q

c) $p \wedge q$

d) $p \vee q$

v) How many ways can be letters of the word "LEADER" be arranged?
a) 72

b) 144

☒ c) 360

d) none of these

vi) The generating function for the sequence $\frac{1}{3}, -\frac{1}{3}, \frac{1}{3}, -\frac{1}{3}, \dots$ is

☒ a) $\frac{1/3}{(1+x)}$

b) $\frac{1}{3(1-x)}$

c) $\frac{1}{\frac{1}{3}(1-x)}$

d) $\frac{-3}{(1-x)}$

vii) What is the minimum no. of vertices necessary for a graph with 6 edges?

a) 6

b) 5

☒ c) 7

d) none of these

viii) A simple graph has

a) no parallel edges

b) no loops

☒ c) both (a) and (b)

d) no isolated vertex

ix) The difference between Mealy and Moore Machine lies on

a) state transition

☒ b) output function

c) input function

d) none of these

x) Maximum number of edge with n vertices in a completely connected graph is

a) $(n-1)$

b) $n/2$

c) $(n-1)/2$

☒ d) $n(n-1)/2$

xi) If a binary tree has 20 pendant vertices, then number of internal vertices of the tree is

a) 20

b) 21

c) 23

☒ d) 19

Group - B

(Short Answer Type Questions)

2. a) How many words can be made using all the letters in the word MONDAY?

b) In how many ways can the letters of the word ALGEBRA be arranged, such that two As are never together.

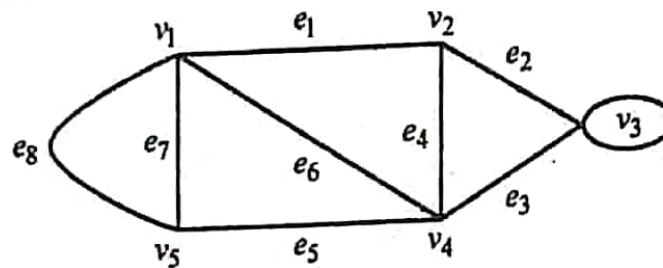
See Topic: COMBICOTRONICS, Short Answer Type Question No. 14 (a) & (b).

3. Find the sequence for following generating function:

$$3x(1-x)^5.$$

See Topic: INDUCTION AND RECURSION, Short Answer Type Question No. 13.

4. Construct incidence matrix from the following graph:



See Topic: GRAPH THEORY, Short Answer Type Question No. 26.

5. Write short notes on More Machine.

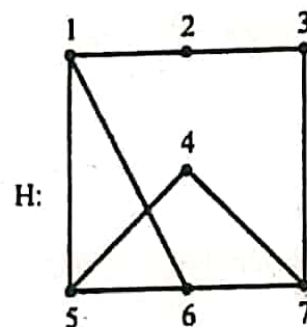
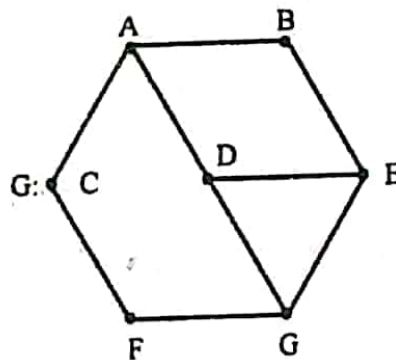
See Topic: MOORE MEALY MACHINE, Long Answer Type Question No. 4.(b).

6. What is Deterministic finite automata (DFA)? Explain with suitable example.

See Topic: FINITE AUTOMATA, Short Answer Type Question No. 2.

Group – C
(Long Answer Type Questions)

7. a) Examine Graphs H and G are isomorphic or not:



See Topic: GRAPH THEORY, Long Answer Type Question No. 8.

b) Prove that

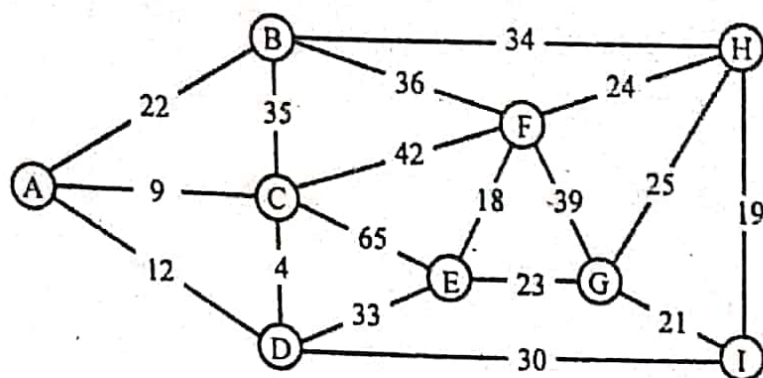
$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n(n+1)} = \frac{n}{(n+1)} \text{ by using mathematical induction.}$$

See Topic: INDUCTION AND RECURSION, Long Answer Type Question No. 9.

c) A graph has 21 edges, 3 vertices each of degree 4 and rest of the vertices are of degree 3. Find out the total number of vertices.

See Topic: GRAPH THEORY, Long Answer Type Question No. 9.

8. a) Using Kruskal's algorithm find minimal spanning tree of the following graph:



b) Prove that a simple graph with n vertices and k components has at most $\frac{(n-k)(n-k+1)}{2}$ edges.

See Topic: GRAPH THEORY, Long Answer Type Question No.10 (a) & (b).

9. a) Solve the recurrence relation $a_{n+2} - 4a_{n+1} + 4a_n = 0$, ($n \geq 0$) with $a_0 = 2$ and $a_1 = 1$ using generating function.

See Topic: INDUCTION AND RECURSION, Long Answer Type Question No. 10.

b) Convert the given Moore Machine to its equivalent Mealy Machine.

Present state	Next state		Output
	Input $a = 0$	Input $a = 1$	
$\rightarrow q_0$	q_3	q_1	0
q_1	q_1	q_2	1
q_2	q_2	q_3	0
q_3	q_3	q_0	0

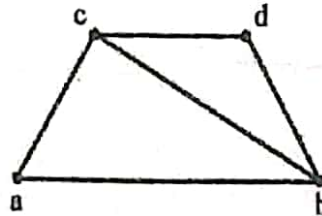
See Topic: MOORE MEALY MACHINE, Long Answer Type Question No. 2(a).

10. a) Construct truth table and determine whether the following proposition is tautology or contradiction.

$$\{(p \wedge \sim q) \rightarrow r\} \rightarrow \{p \rightarrow (q \vee r)\}$$

See Topic: MATHEMATICAL LOGIC, Long Answer Type Question No. 7.

b) Find all spanning trees from the following graph G:

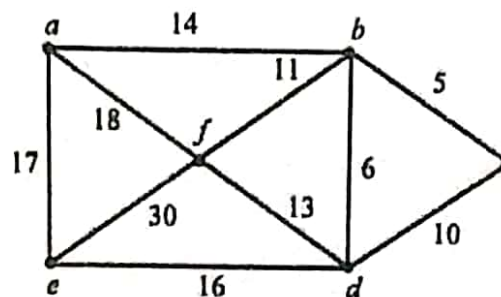


See Topic: GRAPH THEORY, Long Answer Type Question No. 11.

11. a) Draw the graph whose incidence matrix is given below:

$$\begin{bmatrix} 0 & 0 & 1 & -1 & 1 \\ -1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 \end{bmatrix}$$

b) By Prim's Algorithm find a minimal spanning tree and the corresponding weight of the spanning tree in the following graph:



a) *Incomplete Question.*

b) See Topic: GRAPH THEORY, Long Answer Type Question No. 12.