

**B.SC. (A & G) SEM. – I (OLD COURSE) (ANIMATION & GAMING) : WINTER - 2017**  
**SUBJECT: MATHEMATICAL FOUNDATION**

Day: **Monday**  
 Date: **18/12/2017**

Time: **10.00 AM TO 01.00 PM**  
 Max. Marks: 80

**W-2017-0897**

**N.B.:**

- 1) Attempt any **FIVE** full questions out of **SEVEN**.
- 2) Figures to the right indicate **FULL** marks.

**Q.1 a)** Define Adjacency Matrix. Draw the graph corresponding to the adjacency matrix. **(06)**

$$A = \begin{bmatrix} 0 & 2 & 0 & 1 \\ 2 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

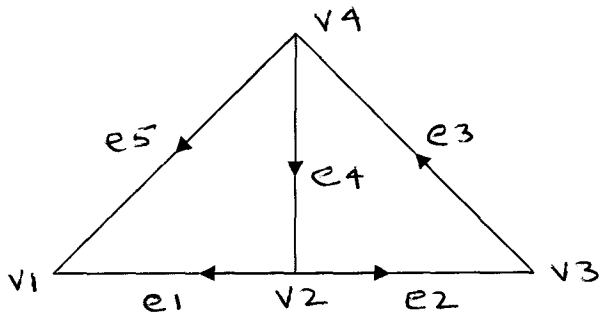
**b)** Prove that in a graph, the number of vertices of odd degree is even. **(06)**

**c)** Define the following, with examples: **(04)**

- i) Spanning Tree
- ii) Isomorphic graphs

**Q.2 a)** Prove  $(A \cup B) \cup C = A \cup (B \cup C)$ . **(08)**

**b)** Define Incidence Matrix. Determine the incidence matrix for the directed graph shown. **(08)**



**Q.3 a)** Write the Truth table for: **(04)**

- i)  $p \vee \neg q$
- ii)  $\neg p \wedge q$

**b)** Verify whether the proposition **(04)**

$(p \wedge q) \wedge \neg(p \vee q)$  is a tautology or contradiction.

**c)** Prove that  $1 + 2 + 3 + \dots + n = n(n+1)/2$ . **(08)**

**Q.4 a)** Each student in a college has a mathematics requirement A and a science requirement B. A poll of 140 students showed, that 60 completed A, 45 completed B, and 20 completed both A and B. Find the number of students who have completed: **(08)**

- i) At least one of A and B
- ii) Neither A, nor B.

**b)** Let  $A = \{2, 3, 4, 5\}$  **(08)**

- i) Show that A is not a subset of  $B = \{x \in N \mid x \text{ is even}\}$
- ii) Show that A is a proper subset of  $C = \{1, 2, 3, \dots, 8, 9\}$ .

**P. T. O.**

**Q.5 a)** A binary tree produced the following sequences during the in-order and pre order traversals: (08)

In- order: D B F E A G C L J H K

Pre order: A B D E F C G H J L K

- i) Draw the tree
- ii) Determine the post-order traversal.

**b)** Define Binary Search Tree( BST) construct the BST for the following data: (08)  
19, 18, 47, 56, 35, 12, 22, 44, 10

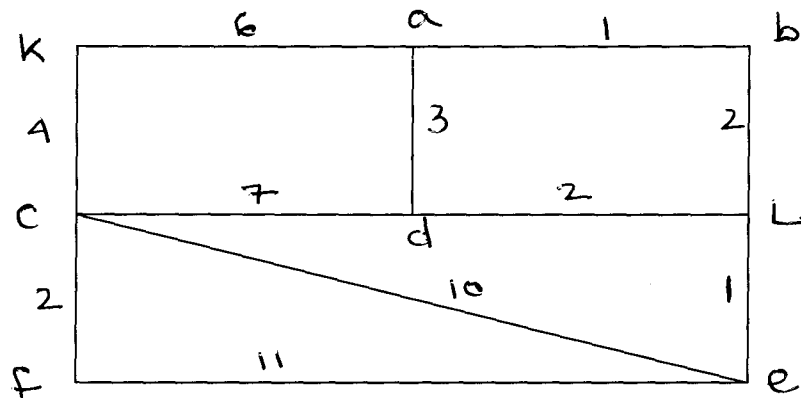
**Q.6 a)** Prove that  $A \cup B = \phi \Rightarrow A = \phi$  and  $B = \phi$ . (03)

**b)** Determine the number of ways in which 5 boys and 6 girls can be seated at a round table, of no two boys can be seated together. (05)

**c)** Prove that  $\sqrt{2}$  is not rational. (04)

**d)** Define the following giving on example for each: (04)  
i) Complete graph ii) Tree

**Q.7 a)** Describe shortest path algorithm? Find the shortest path form K for L in the following graph: (08)



**b)** Consider functions  $f : A \rightarrow B$  and  $g : B \rightarrow C$ . (04)

Prove:

- i) If f and g are one to one then gof is one to one
- ii) If f and g are onto, than gof is onto.

**c)** Let f and g be defined by  $f(x) = 2x + 1$  and  $g(x) = x^2 - 2$ . Find the formula determining composition function gof. (04)

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