

POKHARA UNIVERSITY

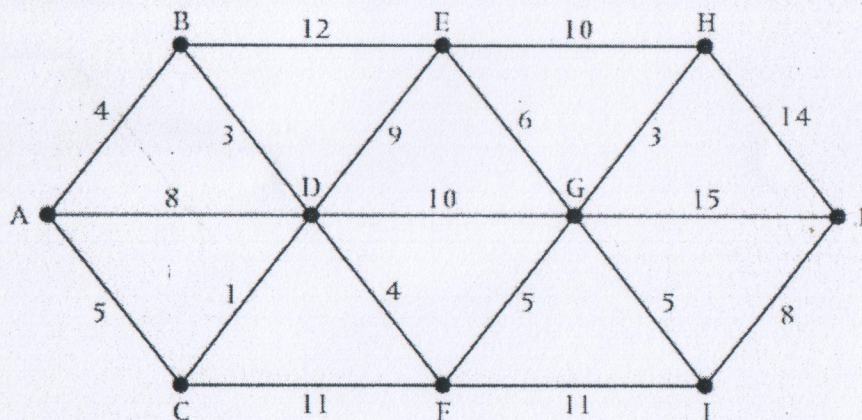
Level: Bachelor Semester –Fall Year : 2017
 Programme: BCA Full Marks: 100
 Course: Mathematical Foundation of Computer Science Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define Euler graph, Hamiltonian graph, complete bipartite graph and isomorphic graph giving example of each. 8
- b) What is a planar graph? Suppose that a connected planar graph has eight vertices, each of degree three. Into how many regions, is the plane divided by a planar representation of this graph? 7
2. a) Find the shortest path from A to J in the following graph. 8



- b) Define adjacency and incidence matrix. Write the adjacency matrix for the complete graph on 5 vertices K_5 . 7
3. a) Find the inverse, contra-positive and converse of the statement "If the Internet is down, then Ram cannot browse the websites." 5
- b) Let $L(x,y)$ be the statement "x loves y". Use the quantifiers to express each of the following statements: 5
 - i. Everybody loves Ram.

- ii. Nobody loves everybody.
- iii. Everybody loves somebody.
- iv. There is somebody whom no one loves.
4. a) Using induction prove that, $11^n - 6$ is divisible by 5, for all $n \geq 1$. 5
- a) Give a direct proof of the following statement "for all integers m and n, if m is odd and n is even, then $m + n$ is odd". 5
- b) Consider the following statements: "I take the bus or I walk. If I walk I get tired. I do not get tired. Therefore I take the bus." Draw a formal proof for conclusion using inference rules. 5
- c) Check the following logical equivalences using truth table 5
 - i. $\neg(p \rightarrow q) \equiv p \wedge \neg q$
 - ii. $p \rightarrow q \equiv \neg q \rightarrow \neg p$
5. a) Solve the homogeneous recurrence relation $f_n = f_{n-1} + f_{n-2}$, for all $n \geq 3$, with the initial conditions $f_1 = f_2 = 1$. 8
- b) A factory makes custom sports cars at an increasing rate. In the first month only one car is made, in the second month two cars are made, and so on, with n cars made in n^{th} month. 7
 - i. Set up a recurrence relation for the numbers of cars produced in the first n months by the factory.
 - ii. Find the explicit formula for the number of cars produced in first n months.
6. a) Draw the transition diagram for the finite state machine (I, O, S, f, g, σ_0) where $I = \{a, b, c\}$, $O = \{0, 1\}$, $S = \{\sigma_0, \sigma_1, \sigma_2\}$ and 8

| S\I | F | | | g | | |
|------------|------------|------------|------------|---|---|---|
| | a | b | c | a | b | c |
| σ_0 | σ_0 | σ_1 | σ_2 | 0 | 1 | 0 |
| σ_1 | σ_1 | σ_1 | σ_0 | 1 | 1 | 1 |
| σ_2 | σ_2 | σ_1 | σ_0 | 1 | 0 | 0 |

Is it FSA or not? If it is FSA then draw the transition diagram of equivalent FSA.

- b) Define grammar and language. Write about different types of grammar. 7
7. Write short notes on **any two**: 2×5
 - a) Applications of Graph theory in computer science
 - b) Inference Rules for quantifiers
 - c) Recursive and Recurrence relation.