 nEPAL COLLEGE OF INFORMATION AND TECHNOLOGY

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| Level: Bachelor | Semester – SPRING | Year : 2020 |
| Programme: BCA | | Full Marks : 100 |
| Course: Mathematical foundation of computer science | | Time : 3 hrs. |

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| *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. |

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|  | a. | Define Hamilton graph and Euler graph with example. Write two differences between them. | 5 |
|  | b. | Define adjacency and incidence matrix. Write the incidence matrix for the complete bipartite graph K2,3. | 5 |
|  | c. | *Prove Euler’s formula for the planner graph..* | 5 |
| 2. | a. | Show that for n vertices, for a complete graph the number of edges is given by | 5 |
|  | b. | *.Write about DIjkstra’s algorithm. Find the shortest path from node 0 t0 4 by Dijkastra’s algorithm.*C:\Users\sd\Desktop\Fig-11.jpg | 5 |
|  | c. | What is spanning tree? How is it different from minimum spanning tree? What are the different algorithms to generate minimum spanning trees from a graph? Write one of those algorithms. Use the algorithm to generate minimum spanning tree from given graph. | 5 |
| 3. | a. | State and prove Handshaking theorem  . Verify this theorem with suitable example. | 5 |
|  | b. | Show that following relations are logically equivalent using truth table.   1. (p) And p⌐q are logically equivalent.   ii) ⌐ (p (⌐pq)) and ⌐p⌐q are logically equivalent. | 5 |
|  | c. | Write the converse, inverse and contrapositive of the following conditional proposition  “The home team wins whenever it is raining” | 5 |
| 4. | a. | Define universal quantification and existential quantification. Write when these quantification are true and false with suitable example. | 5 |
|  | b. | Let p(x) is the propositional function, then show that the expression are logically equivalent. : | 5 |
|  | c. | |  | | --- | | Verify the validity of the following argument by using the rule of inferences. If Dilendra does not work in a bank then he is not a bank manager. Dilendra doesnot use tally.If Dilendra work in abank then he uses GUNCASE. Either Dilendra is a bank manager or he uses Tally. Hence Dilendra uses Guncase. | | 5 |
| 5 | a. | ````Define direct proof and indirect proof. Using proof by contradiction that” The difference of a rational number and irrational number is irrational”. | 5 |
| 6 | b.  c.  a.  b.  c. | |  | | --- | | Use by mathematical induction that “8n-3n” is divisible by 5,n  A person invests Rs.1000 at 12% interest per annum. If An represents amount at the end on n years, Find the recurrence relation with initial condition and also find the explicit formula. | | Solve the following recurrence relation: an=5an-1-6an-2+7n; where a0=1 and a1=2.  B. Define Finite state machine. How to construct a transition diagram. Give an example of a finite state machine with state table and state diagram (Transition diagram).  Differentiate between NFA and DFA. Convert the given NFA into DFA:   |  |  |  |  | | --- | --- | --- | --- | | S/I | F | | | | a | b | c | | 🡪P | {P,Q} | {Q} | ∅ | | Q | {R,S} | {Q} | {P,Q} | | R | {P} | ∅ | {Q} | | \*S | {R} | {R,S} | ∅ | |  | | | | | | 5  5  5  5  5 |

7. a. Determine whether the word cbab belongs to the language generated by the grammar

G=(V,T,S,P) where V=(a,b,c,A,B,C,S),T=(a,b,c),S is starting symbol, and the productions are 5

A  ca

B Ba

B  cb

B  b

C cb

C  b

7. B)Define grammar and Language. Write about different types of grammar. 5