PUCP/161-50,000 22-04-2021

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Total No. of Sheets used.....
No. of Questions set 9

SHEETS NO. 1
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Panjab University, Chandigarh

Examination: BCA (5th Semester) January 2022
Course Name: Discrete Mathematical Structure Course Code: BCA-16-502
Time Allowed: 3 Hours Maximum Marks: 65

Note: Attempt FIVE questions an all, including Q-9 in section-E, which is compulsory and taking ONE Question each from Sections A-D. Each Question carries 18 marks.

SECTION-A

1)
a) Let R = {(3, 1), (1, 3), (3, 3)} be a relation defined on the set A = {1, 2, 3}. Then R is symmetric, transitive but not reflexive.
b) Show that the function $f:\Re\to\Re$ *defined by* $f(x)=\cos(x),\ \forall x\in\Re$, is neither one-one nor onto. (7, 6)

2)
a) Let $A\times B$ = {(1, 1), (2, 2), (3, 1), (3, 2), (1, 2), (1, 4), (2, 1), (2, 4), (3, 4)}. Find the power set of B, P(B).
b) Find $g\circ f$ *and* $g\circ g$ for the functions f and g as defined below:

$f,g:\Re\to\Re$ *defined, respectively, by* $f(x)=x^2+3x+1,\ g(x)=2x-3,\forall x\in\Re.$ (7, 6)

SECTION-B

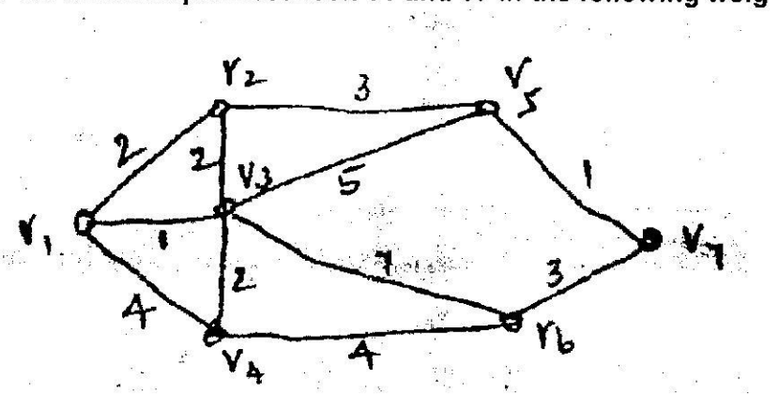
3) Solve the following recurrence relation :
$S(n)-4S(n-1)-11S(n-2)+30S(n-3)=0$ *with* $S(0)=0, S(1)=-35$ *and* $S(2)=-85.$ (13)

4) Solve the following recurrence relation by using the method of generating functions:
$h_n=h_{n-1}+h_{n-2}\ (n\geq 2);\ h_0=1,\ h_1=3.$ (13)

SECTION-C

5)
a) If a graph has exactly two vertices of odd degree, prove that there must be a path joining these two vertices.
b) Prove that in a graph G, the number of vertices of odd degree is even. (7, 6)

6)
a) Explain the travelling-salesman problem and its solution.
b) What is the shortest path between v1 and v7 in the following weighted graph?



(6, 7)

SECTION-D

7) What is a state in a finite state machine (FSM)? Consider the set of strings over *{0, 1, 2}* such that the sum of the digits is a multiple of *3*. Draw a deterministic finite-state machine that accepts this language. Use as few states as possible. (13)

8) Define computer algorithm and its features. Explain $O,\ \Theta$ *and* Ω notations used in analyzing algorithms with diagrams. (13)

SECTION-E (Compulsory Question)

9)
a) What are the applications of Venn diagrams?
b) How many edges are there in a graph with 10 vertices each of degree 5?
c) What do you mean by recursive algorithm?
d) Explain what is meant by 'complexity of problems' in relation to computer science.
e) Define Degree of a Graph.
f) Draw the graph of the function $f(x)=|x|+5$ *for* $x\in[-5, 5].$ (5x2,3=13)

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