Total No. of Questions – [08] Total No. of Printed Pages - 04

G.R. No.	

U218-121 (ESE), U218-141 (ESE)

DECEMBER 2018/ENDSEM

S. Y. B. TECH. (COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY)

(SEMESTER - I)

COURSE NAME: DISCRETE STRUCTURES & GRAPH THEORY

COURSE CODE: CSUA21171/ ITUA21171

(PATTERN 2017)

Time: [**2 Hours**] [Max. Marks: **50**]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q1) a) Prove that for every positive integer n, [06]
$1 \cdot 2 + 2 \cdot 3 + \cdots + n(n+1) = n(n+1)(n+2)/3$.

OR

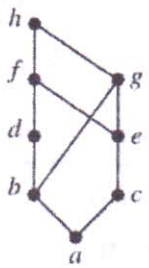
b) There are 2504 computer science students at a school. Of these, 1876 have taken a course in Java, 999 have taken a course in Linux, and 345 have taken a course in C. Further, 876 have taken courses in both Java and Linux, 231 have taken courses in both Linux and C, and 290 have taken courses in both Java and C. If 189 of these students have taken courses in Linux, Java, and C, how many of these 2504 students have not taken a course in any of these three programming languages? [06]

Q2 a) Find all solutions of the recurrence relation $a_n = 2a_{n-1} + 3^n$. [06]

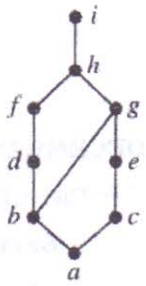
OR

b) Determine whether the POSETs with these Hasse diagrams are lattices. [06]
Justify your answer.

i)

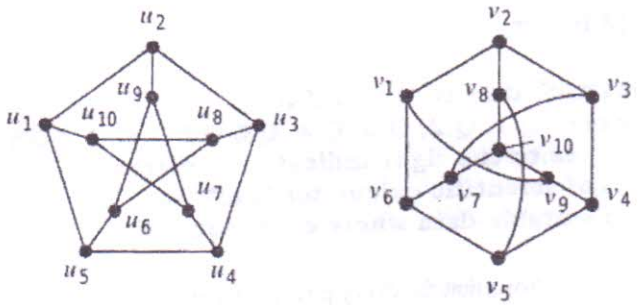


ii)

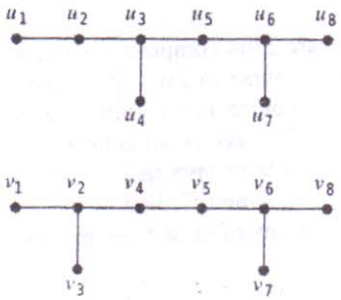


Q3 a) Determine whether the following pair of graphs are Isomorphic [06]

i)

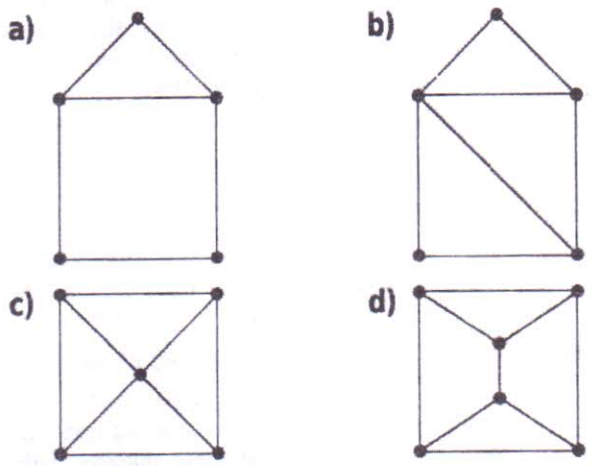


ii)

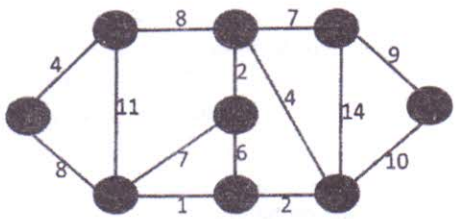


OR

b) For each of these graphs, determine (i) whether Dirac's theorem can be used to show that the graph has a Hamilton circuit, (ii) whether Ore's theorem can be used to show that the graph has a Hamilton circuit, and (iii) whether the graph has a Hamilton circuit. [06]



Q4) a) Find the minimum spanning tree using Kruskal's Algorithm [04]



OR

b) Generate the Huffman codes and find the average bit length for the following data set [04]

Character	a	b	c	D	e	f
Frequency	5	9	12	13	16	45

Q5) a) How many ways are there to distribute five balls into three boxes if each box must have at least one ball in it if [06]
a) both the balls and boxes are labeled?
b) the balls are labeled, but the boxes are unlabeled?

b) How many license plates can be made using [04]
i) either two uppercase English letters followed by four digits or two digits followed by four uppercase English letters?
ii)either two or three uppercase English letters followed by either two or three digits?

c) A company stores products in a warehouse. Storage bins in this warehouse are specified by their aisle, location in the aisle, and shelf. There are 50 aisles, 85 horizontal locations in each aisle, and 5 shelves throughout the warehouse. What is the least number of products the company can have so that at least two products must be stored in the same bin? [04]

OR

Q6) a) Show that in a group of 10 people (where any two people are either friends or enemies), there are either three mutual friends or four mutual enemies, and there are either three mutual enemies or four mutual friends. [06]

b) What is the coefficient of x^{13} and x^{9} in $(2-x)^{19}$? [04]

c) Show that if five integers are selected from the first eight positive integers, there must be a pair of these integers with a sum equal to 9. Is the conclusion true if four integers are selected rather than five? [04]

Q7 a) Find the probability distribution of number of doublets in four throws of a pair of die [06]

b) A fair coin is flipped three times. Let S be the sample space of the eight possible outcomes, and let X be the random variable that assigns to an outcome the number of heads in this outcome. What is the expected value of X? [04]

c) Assume it is equally likely that a person is born in any given month of the year. What is the probability that [04]
i) two people chosen at random were born during the same month of the year?
ii) in a group of n people chosen at random, there are at least two born in the same month of the year?

OR

Q8 a) Suppose that one person in 100,000 has a particular rare disease for which there is a fairly accurate diagnostic test. This test is correct 99.0% of the time when given to a person selected at random who has the disease; it is correct 99.5% of the time when given to a person selected at random who does not have the disease. Given this information can we find [06]
(a) the probability that a person who tests positive for the disease has the disease?
(b) the probability that a person who tests negative for the disease does not have the disease?
Should a person who tests positive be very concerned that he or she has the disease?

b) What is the conditional probability that exactly four heads appear when a fair coin is flipped five times, given that the first flip came up heads? [04]

c) Find the variance of the number obtained on a throw of an unbiased die [04]