Total No. of Questions – [08] Total No. of Printed Pages - 03

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DECEMBER 2019/ENDSEM Backlog Exam

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) A total of 1232 students have taken a course in Spanish, 879 have taken a course in French, and 114 have taken a course in Russian. Further, 103 have taken courses in both Spanish and French, 23 have taken courses in both Spanish and Russian, and 14 have taken courses in both French and Russian. If 2092 students have taken at least one of Spanish, French, and Russian, how many students have taken a course in all three languages? [06]

OR

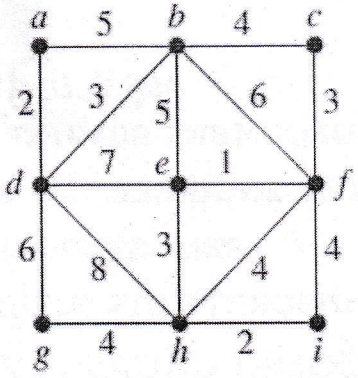
b) Comment on logical equivalence of the formulas $(p \rightarrow q) \rightarrow (r \rightarrow s)$ and $(p \rightarrow r) \rightarrow (q \rightarrow s)$ [06]

Q2 a) Data are transmitted over a particular Ethernet network in blocks of 1500 octets (blocks of 8 bits). How many blocks are required to transmit the following amounts of data over this Ethernet network? [06]
i) 150 kilobytes of data
ii) 384 kilobytes of data
iii) 1.544 megabytes of data
iv) 45.3 megabytes of data

OR

b) Solve the recurrence relation $a_n = -3a_{n-1} - 3a_{n-2} - a_{n-3}$ with $a_0 = 5$, $a_1 = -9$, and $a_2 = 15$. [06]

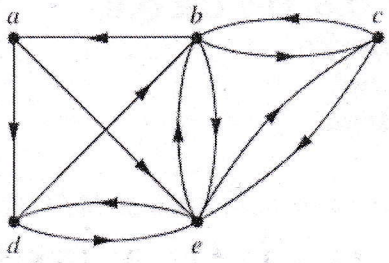
Q3) a) Construct a minimum spanning tree using Kruskal's algorithm [06]



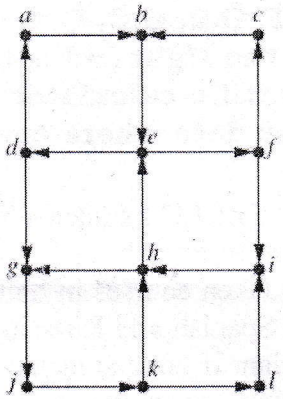
OR

b) Determine whether the given graphs have Euler circuit and Path. Justify your answer. [06]

i)



ii)



Q4) a) 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

OR

b) Draw an expression tree and represent postfix and prefix form for the following expression 4 * a - (6 + b) + 8 / (9 - 7) [04]

Q5 a) Five boys and five girls form a line. Find the number of ways of making the seating arrangement under the following condition: [06]
(a) Boys and girls alternate
(b) No two girls sit together

b) A bag contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the bag, if at least one black ball is to be included in the draw? [04]

c) Find the coefficient of $x^5 y^8$ and $x^6 y^7$ in $(x + y)^{13}$. [04]

OR

Q6 a) There are 10 professors and 20 lecturers out of whom a committee of 2 professors and 3 lecturers are to be formed. Find : [06]
(a) In how many ways committee can be formed
(b) In how many ways a particular professor is included

b) A bag contains 10 red marbles, 10 white marbles, and 10 blue marbles. What is the minimum no. of marbles you have to choose randomly from the bag to ensure that we get 4 marbles of same color? [04]

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

Q7 a) Two cards from an ordinary deck of 52 cards are missing. What is the probability that a random card drawn from this deck is a spade? [06]

b) A family has two children. Given that one of the children is a boy, and that he was born on a Tuesday, what is the probability that both children are boys? [04]

c) What is the variance of the random variable $X((i, j)) = 2i$, where i is the number appearing on the first die and j is the number appearing on the second die, when two fair dice are rolled? [04]

OR

Q8 a) Urn 1 contains 5 white balls and 7 black balls. Urn 2 contains 3 whites and 12 black. A fair coin is flipped; if it is Heads, a ball is drawn from Urn 1, and if it is Tails, a ball is drawn from Urn 2. Suppose that this experiment is done and you learn that a white ball was selected. What is the probability that this ball was in fact taken from Urn 2? (i.e., that the coin flip was Tails) [06]

b) Balls numbered 1 through 20 are placed in a bag. Three balls are drawn out of the bag without replacement. What is the probability that all the balls have odd numbers on them? [04]

c) What is the expected value of the sum of the numbers that appear when a pair of fair dice is rolled? [04]