Reg. No. : | | | | | | | | | | |

Question Paper Code: 31501

B.E/B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Fifth Semester

Computer Science and Engineering

01UMA521 – DISCRETE MATHEMATICS

(Common to Information Technology)

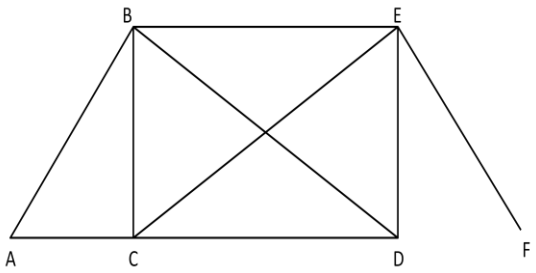
(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Construct a truth for *(7p <-> 7q) <-> (p <-> q).*
2. Define universal and existential quantifiers.
3. Show that in any group of eight people, at least two have birthdays which fall on the same day of the week in any given year.
4. In how many ways can integers 1 through 9 be permuted such that no odd integer will be in its natural position?
5. Find the number of vertices, the number of edges and the degree of each vertex in



6. Give an example of a graph which contains an Eulerian circuit that is also a Hamiltonian circuit.
7. Define a group with an example.
8. Let (*R*, +, .) ba a ring. For a, *bεR* show that *a.(-b) = -(a.b)*

9. Determine whether the poset [{1, 2, 3, 5), /] is latices or not.

10. Show that in any Boolean algebra $(a+b)(a'+c) = ac + a'b + bc$.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Show that $Q.V\ (P \wedge 7Q) \vee (7P \wedge 7Q)$ is a tautology. (8)

(ii) Obtain PDNF of $(P \wedge Q)\ V\ (7P \wedge R)\ V\ (Q \wedge R)$. Also find PCNF. (8)

Or

(b) (i) Show that RVS follows logically from the premises *CVD, CVD -> 7H, 7H ->A∧7B* and *(A∧7B) -> (RVS).* (8)

(ii) Check the following set of premises is inconsistent

(1) If tharun gets his degree, he will go for a job

(2) If he goes for a job, he will get married soon

(3) If he goes for higher study, he will not get married

(4) Tharun gets his degree and goes for higher study. (8)

12. (a) (i) How many bit strings of length 10 contain

(1) exactly four 1's (2) at most four 1's (3) at least four 1's

(4) an equal number of 0's and 1's. (8)

(ii) A man hiked for 10 hours and covered a total distance of 45 *km*. It is known that he hilled 6 *km* in the first hour and only 3 *km* in the last hour. Show that he must have hiked at least 9 *km* within a certain period of 2 consecutive hours. (8)

Or

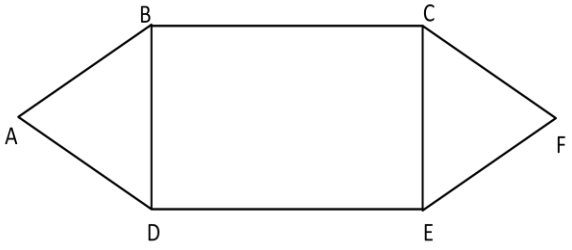
(b) (i) Solve the recurrence relation $a_n = 2a_{n-1} + 2^n$, $a_0 = 2$. (8)

(ii) Prove by mathematical induction, that

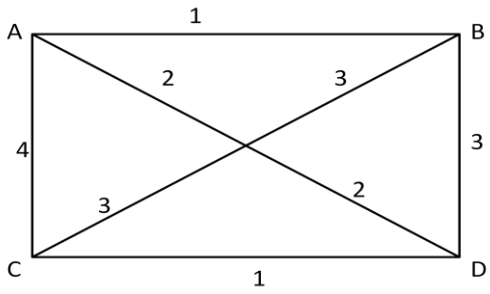
$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\ldots\ldots\ldots+\frac{1}{n(n+1)}=\frac{n}{n+1}$$

(8)

13. (a) (i) Find all the simple paths from *A* to *F* and all the circuits in the graph. (8)



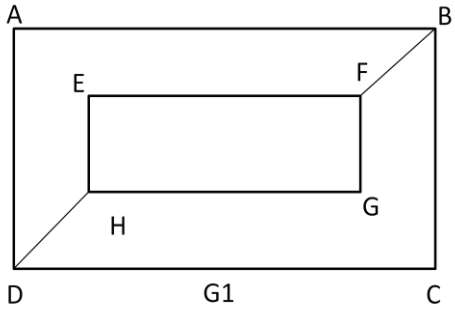
(ii) Use Prim's an algorithm to find a minimum spanning tree for the weighted graph. (8)

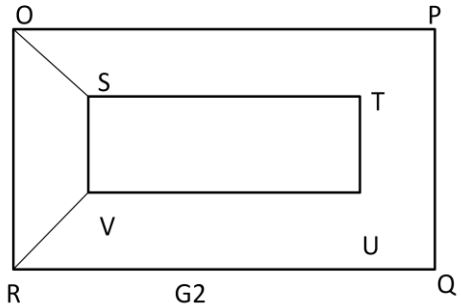


Or

(b) (i) If all the vertices of an undirected graph are each of odd degree *k*, show that the number of edges of the graph is a multiple of *K*. (8)

(ii) Determine whether the graphs are isomorphic or not. (8)





14. (a) (i) State and prove Lagrange's theorem. (8)

(ii) Show that the intersection of two normal sub groups of a group *G* is also a normal subgroup of *G*. (8)

Or

(b) (i) Prove that every subgroup of a cyclic group is cyclic. (8)

(ii) If * is the binary operation on the set of real numbers defined by $a*b = a+b+2ab$, show that $(R,*)$ is a commutative monoid. (8)

15. (a) (i) Show that the complement of every element in a Boolean algebra is unique. (8)

(ii) Consider the set of all divisors of 24, check does this form a POSET. Also draw the Hasse diagram of $(D_{24}, /)$. (8)

Or

(b) (i) Let $(L,*,\oplus)$ be a distributive lattice. For any $a, b, c \in L$.
prove that $(a*b = a*c) \wedge (a \oplus b = a \oplus c) \Rightarrow b = c$. (8)

(ii) In any Boolean algebra, show that $a = b$ if $a\bar{b} + \bar{a}b = 0$. (8)

31501