Exam. Code: 0031
Sub. Code: 0948

2021

Bachelor of Computer Applications

5th Semester

BCA-16-502: Discrete Mathematical Structure

Time allowed: 3 Hours | Max. Marks: 65

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting one question from each Unit I-IV.*

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I. (a) For sets A, B & C, prove that $A-(B\cup C)=(A-B)\cap(A-C)$

(b) Given $A=\{1,2,3,4\}$. Let $R=\{(1,1)(2,2)(3,2)(2,3),(4,2),(4,4)\}$ be a relation on A.
Is R reflexive, transitive? Justify your answer.

(c) Write the generating function of one sequence $\frac{1}{2}(-1)^n+\left(\frac{1}{3}\right)^{n-1}$.

(d) Determine the number of edges in a graph with 6 vertices, 2 of degree 4 and 4 of degree 2. Draw such a graph.

(e) Can there exist a simple graph with degree sequence 1,2,3,4? Explain your answer.

(f) If $u=a^2babb$ & $v=ba^2b^2a$ then find uv *and* vu. Are they equal? (2+2+2+2+2+3)

UNIT-I

II. (a) For a certain test, a candidate could offer English or Hindi or both the subjects. Total number of students was 500, of which 350 appeared in English and 90 in both the subjects. Find how many appeared (i) in English only? (ii) in Hindi only? (iii) in Hindi?

(b) Let $B_1=\{1,3,5\}$ *and* $B_2=\{1,2,3\}$ be subsets of a set $A=\{1,2,3,4,5,6\}$.

(i) Find the mixsets and maxsets generated by B_1 and B_2.

(ii) Do minsets and maxsets form a partition of A?

(iii) Illustrate via Venn diagram all mixsets obtained in part (i) (7+6)

III. (a) If R is the relation "less than" from $A=\{1,2,3,4,5\}$ *to* $B=\{1,4,5\}$, express R as a set of ordered pairs. Find the domain & range of R. Also find R^{-1}.

(b) If $f:R\to R$ is given by $f(x)=x^2+2$ and $g:R\to R$ is given by g(x)=2x-3, find:

(i) (gof)(x)

(ii) (fog)(x) at x=3

(iii) (fof) (x) at x=1

Is (fog)(x)=(gof)(x)? Justify. (7+6)

UNIT-II

IV. (a) Solve the recurrence relation $S(k)-10S(k-1)+9S(k-2)=0$ with S(0)=3, s(1)=11.

(b) Solve the recurrence relation $S(k)-6S(k-1)+8S(k-2)=k.4^k$ with S(0)=8, S(1)=22. (6+7)

P.T.O.

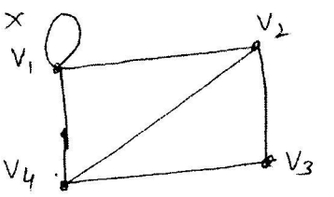
V. (a) Write the sequence whose generating function is given by $\frac{1}{1-5z+6z^2}$.

(b) If $S(k)-6S(k-1)+5S(k-2)=0$ with S(0)=S(1)=2, solve this using the method of generating function. (6+7)

UNIT-III

VI. (a) Prove that the number of edges in a complete graph with n vertices is $\frac{n(n-1)}{2}$.

(b) Find the adjacency matrix and incidence matrix of the graph in figure.



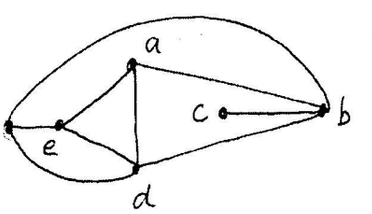
(6+7)

VII. (a) Consider the graph given in figure:

(i) Is the graph a planar? If so specify the number of regions.

(ii) Verify Euler's formula if it is connected and planar.

(iii) Find the sum of degrees of vertices of graph.



(b) (i) Can there be a simple graph with 8 vertices and 29 edges.

(ii) Find k if k-regular graph with 6 vertices has 12 edges. Also draw the k-regular graph. (7+6)

UNIT-IV

VIII. (a) Let $A=\{a,b,c\}$. Find L^* where:

(i) $L=\{b^2\}$ (ii) $L=\{a,b\}$ (iii) $L=\{a,b,c^3\}$

(b) If $A=\{a,b\}$, describe the language L(r) for each of the following regular expression:

(i) $r=aa^*$ (ii) $r=a\vee b^*$ (iii) $r=(a\vee b)^*bb$ (6+7)

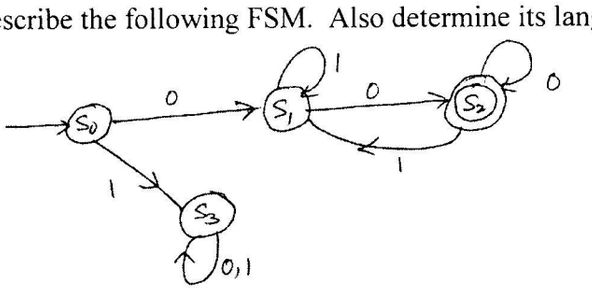
IX. (a) Draw the diagram of the machine whose state transition table is given in the figure:

Find the input set A, the state set S and the initial state.

Does the machine accepts the words 00100100 & 010110

	0	1
S_0	S_0	S_1
S_1	S_1	S_2
S_2	S_2	S_0

(b) Describe the following FSM. Also determine its language.



(7+6)

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