Total No. of Questions : 8] *[Total No. of Printed Pages : 2*

Roll No .....

CS/IT-3005 (CBGS)

B.E. III Semester

Examination, May 2018

Choice Based Grading System (CBGS)

Discrete Structure

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

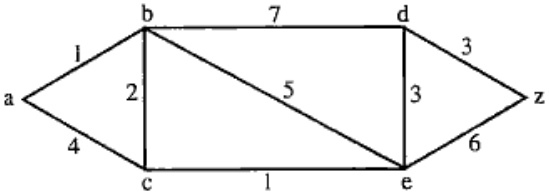
1. a) If U is a universal set and its two subsets A and B, then prove that $(A \cup B)' = A' \cap B'$
   b) Show that the set Q of rational numbers is countable.

2. a) Show that the relation 'is divisor of' in the set of positive integers is reflexive and transitive but not symmetric.
   b) Prove that the sum of the cubes of three successive natural numbers is divisible by 9.

3. a) Show that the mapping $f: R \to R$, $f(x) = \frac{1}{x}$, $x \neq 0$ and $x \in R$ is one-one onto, where R is the set of non-zero real numbers.
   b) Prove that every finite group G is isomorphic to a per mutation group.

4. a) Show that $[(p \wedge q) \Rightarrow p] \Rightarrow (q \wedge \sim q)$ is a contradiction.
   b) Show that the language $L = \{a^m : m = i^2, i \geq 1\}$ is not a finite state

5. a) Find the shortest path from a to z in the following graph, where numbers associated with the edges are the weights.



   b) Define the following with examples:
   i) Multigraph ii) Isomorphic graphs
   iii) Eulerian graph

6. a) Solve the following recurrence relation:
   $a_r - 7a_{r-1} + 10a_{r-2} = 3^r$
   given that $a_0 = 0$, $a_1 = 1$
   b) Let N be the set of positive integers. Prove that the relation $\leq$, where $\leq$ has its usual meaning, is a partial order relation on N.

7. a) Determine the generating function of the numeric function a_r, where:

$$a_r = \begin{cases} 2^r \text{ if } r \text{ is even} \\ -2^r \text{ if } r \text{ is odd} \end{cases}$$

   b) Solve $y_{h+2} - 7y_{h+1} + 10y_h = 0$ with $y_0 = 0$, $y_1 = 3$ by the method of generating function.

8. a) Let $A = \{a, b, c, d\}$ and $P(A)$ its power set. Draw Hasse diagram of $(P(A), \subseteq)$.
   b) Prove that a subgroup H of a group G, is normal if and only if $xHx^{-1} = H$, $\forall x \in G$.

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