B.Sc. (Honours) Examination 2018
Semester-II
Computer Science
Course : CC-IV
(Discrete Structure)

Time : 3 Hours **Full Marks : 60**

Questions are of value as indicated in the margin

Group - A
Answer **any four** questions

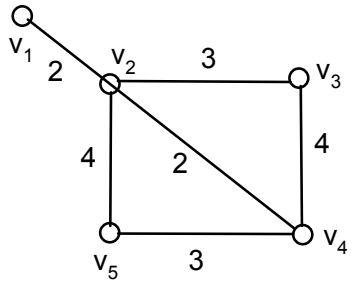
1. a) Prove by induction that $6.7^n - 2.3^n$ is divisible by 4, n an integer ≥ 0.
   b) State and prove the principle of inclusion and exclusion. 5+(1+4)=10
2. a) Define an equivalence relation.
   b) Consider a relation R on the set of all + ve integers I as follows :
   a R b if a – b is divisible by 4, for every $a, b \in I$. Prove that R is an equivalence relation
   c) Show that if any five integers from 1 to 8 are chosen at random then there exist two numbers among them whose sum will be 9. 1+5+4=10
3. a) Determine C_r, the number of sequences of length r that are mode up of letters $\{x, y, z, t, \ \alpha, \beta, \gamma\}$ in which the first portion of each sequence consists of a english letters and the remaining portion consists of greek letters.
   b) Define generating function of a discrete numeric function.
   c) Use suitable generating function to obtain the sum 1+2+3+….+r. 4+1+5=10
4. a) Find the particular solution of
   $a_r - 2 \ a_{r-1} = 3.2^{r+1}$
   b) Find the particular solution of
   $a_r = a_{r-1} + 7$ 5+5=10
5. a) Define the algebraic system induced by a lattice.
   b) State the principle of duality in an algebraic structure defined by a lattice.
   c) Prove that, in a distributive lattice, if an element has a complement then their complement is unique.
   d) State and prove the Demorgan's law in a Boolean algebra. 1+1+4+4=10
6. a) Prove that the statement form $\sim (p \vee \sim q) \vee (p \wedge q)$ is logically equivalent to q.
   b) Define argument form. Explain how the validity of an argument form can be checked.
   c) Prove that the following argument is valid
   p or q
   if p then q;
   ∴ p 4+(1+2)+3=10

P.T.O.

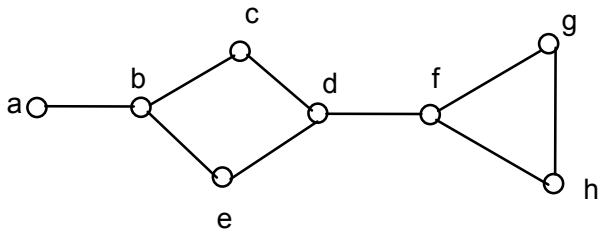
Group – B

Answer **any two** questions

7. a) Show that the number of verties of odd degree in a graph is always even.
   b) Define rank and nullity in a graph. 4+2+4=10
   c) Show that the nullity of a clique of size n is (n–1) (n–2)/2.
8. a) Find, using a suitable algorithm, the minimum spanning tree of the following graph 4+4+2=10



   b) Discuss the following operations on a graph (Give an example of each operation) (i)Union (ii) ringsum (iii) deletion of vertex (iv) fusion.
   c) Distinguish between a cut matrix and path matrix.
9. a) Find, using a suitable algorithm, a maximal independent set and a minimal dominating set for the following graph, 7+3=10



   b) Compare / contrast two kuratowski's graph

———