BAS27

Roll No.

B. Tech.
(SEM III) ODD SEMESTER
MAJOR EXAMINATION 2015 - 2016

DISCRETE MATHEMATICS

Time: 3 Hrs. **Max. Marks: 40**

Note: Answer all questions.

Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.
- (a). In a class of 25 students, 12 have taken Mathematics and 8 have taken Mathematics but not Biology. Find the number of students who have taken mathematics and Biology and those who have taken Biology but not Mathematics. — 4
- (b). Prove that: $(AUB)' = (A' \cap B')$ and $A - B = A \cap B'$. — 3
- (c). Consider two functions $f: R \to R$ and $g: R \to R$ such that $f(x) = x^3 - 4x$, $g(x) = \frac{1}{x^2+1}$. Find $(gog)(x)$ and $(fog)(x)$. — 3
- (d) What do you understand by equivalence relation? Show that if R and S are equivalence relation on set A then $R \cap S$ is also an equivalence relation. — 3

Q.2 Attempt any Three parts of the following. Q. 2(a) is compulsory.
- (a). Prove that (i) $(a^{-1})^{-1} = a$ and — 4
  (ii) $(ab)^{-1} = b^{-1} a^{-1}$ for all a, b ∈ G.
- (b). Show that $\{1, i, -i, -1\}$ is cyclic group of order four. How many generators are there? — 3
- (c). Define ring, integral domain and field with examples. Prove that every finite integral domain is field. — 3
- (d) Show that intersection of two subgroup is again a subgroup but union need not to be subgroup. — 3

Q.3 Attempt any Three parts of the following. Q. 3(a) is compulsory.
- (a). Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$. — 4
- (b). What do you understand by diagraph? Discuss types of diagraph with examples. — 3
- (c). Write shorts notes on the following: — 3
  - (i) Bi-partite graph
  - (ii) Chromatic number
  - (iii) Define Eulerian and Hamiltonian graphs.
- (d) Give the recursive definition of preorder, inorder and postorder tree traversal. — 3

Q.4 Attempt any Three parts of the following. Q. 4(a) is compulsory.
- (a). Determine the recurrence relation given that $a_{n+2} - 4 a_{n+1} + 4 a_n = 2^n$ — 4
- (b). State and prove Pigeon- hole principle. — 3
- (c). Find the number of arrangements of the letters in the word ACCOUNTANT. — 3
- (d) Use generating functions to find the recurrence relation of $a_n - 9 a_{n-1} + 20 a_{n-2} = 0$ with initial condition $a_0 = -3$ and $a_1 = -10$. — 3