Hall Ticket No | | | | | | | | | | | Question Paper Code: AITC01

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech III SEMESTER END EXAMINATIONS (REGULAR/ SUPPLEMENTARY) - FEBRUARY 2024
Regulation: UG20

DISCRETE MATHEMATICAL STRUCTURES

Time: 3 Hours **(CSE | IT | CSIT)** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) By constructing the truth table prove the following: $(p \rightarrow (q \rightarrow s)) \wedge (\neg r \vee p) \wedge q$
[BL: Apply| CO: 1|Marks: 7]

   (b) Show that the following premises are inconsistent:
   i) If Jack misses many classes though illness, then he fails high school
   ii) If Jack reads a lot of books, then he is not uneducated
   iii) If Jack fails high school, then he is educated
   iv) Jack misses many classes through illness and reads a lot of books
[BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Draw the Hasse diagram of D_{30} and also find the least element and greatest element.
[BL: Apply| CO: 2|Marks: 7]

   (b) If R is a relation on the set of positive integers such that $(a, b)\varepsilon R$ if and only if **"ab"** is a perfect square. Show that R is an equivalence relation. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) From a club consisting of 6 men and 7 women, in how many ways can we select a committee of
   i) 4 woman and 3 men
   ii) 4 persons which has at least one woman
   iii) 4 persons that has at most one man
   iv) 4 persons that has both gender. [BL: Apply| CO: 3|Marks: 7]

   (b) If * is the binary operation on the set R of real numbers defined by $a * b = a + b + 2ab$.
   i) Find if (R,*) is a semi group. Is it commutative?
   ii) Find the identity element, if exists. [BL: Apply| CO: 3|Marks: 7]

4. (a) Prove that the set S of all real numbers of the form $a + b\sqrt{2}$, where a, b are integers is an integral domain with respect to usual addition and multiplication
[BL: Apply| CO: 4|Marks: 7]

(b) There are 250 students in an engineering college. Out of these 188 have taken a course in Python,100 have taken a course in C and 35 have taken a course in Java. Further 88 have taken courses in both Python and C, 23 have taken courses in both C and Java and 29 have taken courses in both Python and Java. If 19 of these students have taken all the three courses, how many of these 250 students have not taken a course in any of these three programming languages?
[BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Summarize about generating function and find generating functions for the following sequences:
i) 1, 1, 1.....
ii) 1, 2, 3, 4,.....
iii) 1,a, a^2, a^3,.... [BL: Apply| CO: 5|Marks: 7]

(b) Solve the recurrence relation using the method of generating function
$a^n = 4a_{n-1} - 4a_{n-2} + 4^n$, $n \geq 2$ $a_0 = 2, a_1 = 8$. [BL: Apply| CO: 5|Marks: 7].

6. (a) Write the recurrence relation for Fibonacci number and hence solve it.
[BL: Understand| CO: 5|Marks: 7]

(b) Solve the recurrence relation $4a_{n-1} - 4a_{n-2} + (n+1)2^n = a^n$, $n \geq 1$ $a_0 = 1, a_1 = 8$
[BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) If all the vertices of an undirected graph are each of odd degree k, prove that, the number of edges of the graph is multiple of k. [BL: Understand| CO: 6|Marks: 7]

(b) Verify whether the following graphs G_1 *and* G_2 shown in Figure 1 are isomorphic or not ?
[BL: Apply| CO: 6|Marks: 7]

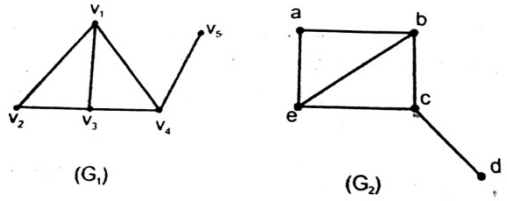

Figure 1

8. (a) Prove that a connected graph contains an Euler circuit, if and only if each of its vertices is of even degree. [BL: Apply| CO: 6|Marks: 7]

(b) Show that the number n of vertices of a full binary tree is odd and the number of pendant vertices of the tree is equal to $\frac{n+1}{2}$ [BL: Apply| CO: 6|Marks: 7]

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