Hall Ticket No | | | | | | | | | | Question Paper Code: AHS013

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech III Semester End Examinations (Regular) - November, 2018

Regulation: IARE – R16

DISCRETE MATHEMATICAL STRUCTURES

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

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Show that $(p \to (q \to r)) \to ((p \to q) \to (p \to r))$ is a Tautology using truth table. **[7M]**

   (b) Show that the statement "Every positive integer is the sum of squares of three integers" is false. **[7M]**

2. (a) Construct the truth table for the formula $(PVQ)\,V\,\neg P$. **[7M]**

   (b) Explain about the tautological implications and logical equivalence using theorem. **[7M]**

UNIT – II

3. (a) Show that a relation R defined on the set of real numbers as (a, b) R (c, d) if $a^2 + b^2 = c^2 + d^2$. Show that R is an equivalence relation. **[7M]**

   (b) Let X={1,2,3,4}and R={⟨x,y⟩|x>y}. Draw the diagram of the graph R and also give its matrix. **[7M]**

4. (a) Illustrate the following function definition with graph. Let X and Y be any two sets. A relation f from X to Y is called a function if for every x∈X there is a unique y∈Y such that (x,y)∈f. **[7M]**

   (b) Let X={1,2,3}, Y={p,q}, and Z={a,b}. Also let f:X→Y be f={⟨1,p⟩,⟨2,p⟩,⟨3,q⟩} and g:Y→Z be given by g={⟨p,b⟩,⟨q,b⟩}. Find gof. **[7M]**

UNIT – III

5. (a) Show that the intersection of any two congruence relations on a set is also a congruence relation. **[7M]**

   (b) Let (Z_4,$+_4$) and (B,+) be the algebraic system. Show that (B,+) is a homomorphic image of (Z_4,$+_4$). **[7M]**

6. (a) Prove using the theorem by showing that the composition of semi group homomorphism is also a semi group homomorphism. **[7M]**

   (b) Let (N,+) be the algebraic system of natural numbers. Define an equivalence relation E on N such that x_1 Ex_2 iff either x_1-x_2 or x_2-x_1 is divisible by 4. Show that E is a congruence relation and that the homomorphism g defined is the natural homomorphism associated with E. **[7M]**

UNIT – IV

7. (a) What is the solution of the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$ for n $\geq$ 2 given that $a_0 = 1$, $a_1 = 6$. **[7M]**

   (b) Find the recurrence relation for the Fibonacci sequence. **[7M]**

8. (a) A computer system considers a string of decimal digits a valid codeword if it contains an even number of 0 digits. For instance, 1230407869 is valid, whereas 120987045608 is not valid. Let a_n be the number of valid n-digit codeword's. find the recurrence relation for a_n. **[7M]**

   (b) Find r recurrence relation for C_n, the number of ways to parenthesize the product of n+1 numbers, x_0, $x_1x_2...x_n$, to specify the order of multiplication. For example, C_3=5 because there are five ways to parenthesize x_0, x_1x_2 x_3 to determine the order of multiplication: $((x_0.x_1)x_2).x_3$ $(x_0.(x_1)x_2).x_3$ $(x_0.\ x_1)$ $(x_2).(x_3)$ $x_0.((x_1)x_2).x_3)$ $x_0.$ $(x_1$ $(x_2$ $.x_3))$. **[7M]**

UNIT – V

9. (a) Prove that if G is connected graph with n vertices and (n-1) edges then G is a tree. **[7M]**

   (b) Show that the graphs G and H displayed in following Figure 1 are isomorphic. **[7M]**

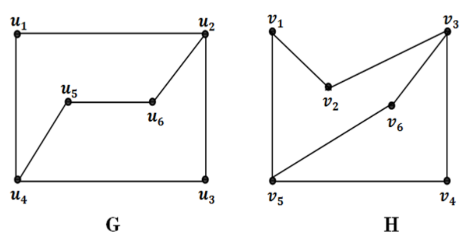

Figure 1

10. (a) Prove that the chromatic number of a tree is always 2 & chromatic polynomial is $\lambda(\lambda - 1)^{n-1}$. **[7M]**

   (b) Show that neither graph displayed in following Figure 2 has a Hamilton circuit. **[7M]**

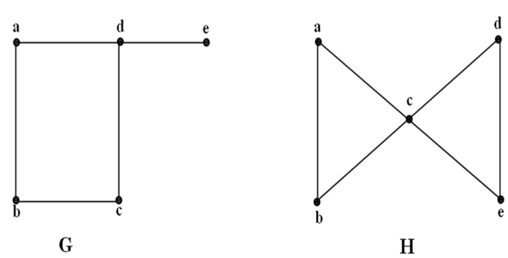

Figure 2

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