

## FACULTY OF ENGINEERING

BE (CSE) III – Semester (AICTE) (Main) Examination, March / April 2022

Subject: Discrete Mathematics

Time: 3 Hours

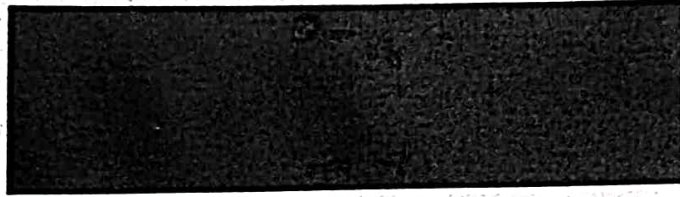
Max. Marks: 70

- Note: (i) First question is compulsory and answer any four questions from the remaining six questions. Each Questions carries 14 Marks.  
 (ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.  
 (iii) Missing data, if any, may be suitably assumed.

- 1 (a) Construct the truth table for  $(p \rightarrow q) \leftrightarrow (\sim p \cup q)$   
 (b) What is the Cartesian product  $A \times B \times C$ , where  $A = \{0, 1\}$ ,  $B = \{1, 2\}$ , and  $C = \{0, 1, 2\}$ ?  
 (c) Let  $f: R \rightarrow R$  and  $g: R \rightarrow R$  where  $f(x) = x^2$ ,  $g(x) = x + 5$  Show that  $f \circ g \neq g \circ f$ .  
 (d) How many ways are these to select five players from 10 member tennis team to make a trip to match to another school?  
 (e) What is inhomogeneous recurrence relation?  
 (f) List out the properties where graph posses to qualify as tree?  
 (g) Define a wheel graph. A wheel graph has  $n+1$  vertices, then determine the edges. Give example to support your answer
- 2 (a) Prove that  $\sqrt{2}$  is irrational.  
 (b) Show that  $\sim p$  is a valid conclusion from premises.  
 $p \rightarrow r, r \rightarrow s, t \cup \sim s, \sim t \cup u, \sim u$ .
- 3 (a) Let  $f: R \rightarrow R$ , be defined by  $f(x) = \begin{cases} 3x - 5; & x > 0 \\ -3x + 1; & x \leq 0 \end{cases}$ , then determine:  
 1.  $f^{-1}$ ,  $f\left(\frac{5}{3}\right)$  and  $f\left(-\frac{5}{3}\right)$   
 2.  $f^{-1}(0)$ ,  $f^{-1}(-6)$ ,  $f^{-1}(1)$   
 (b) Prove that  $(Q^+, *)$  where  $*$  is a binary operation defined by  $a * b = ab/5$  is a group?
- 4 (a) Find the coefficient of  $x^{12}$  in  $(1 - 4x)^{-5}$   
 (b) Solve the recurrence relation  $a_n - 7a_{n-1} + 10a_{n-2} = 0$  for  $n \geq 2$  with initial conditions  $a_0 = 10, a_1 = 41$
- 5 (a) Solve the recurrence relation  $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$  for,  $n \geq 3$ ,  $a_0 = 0, a_1 = 1, a_2 = 10$  using generating function method.  
 (b) State and explain the properties of the pigeonhole principle.



- 6 (a) Draw and explain BFS and DFS algorithms for following graph.



- (b) Show that any graph with 4 or fewer vertices is planar.

7 Write short notes on any two:

- (a) Algebraic Structure
- (b) Euler Circuits and Hamiltonian graphs
- (c) Isomorphic Graphs

