

Code No: 154AQ

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, November/December - 2020

DISCRETE MATHEMATICS

(Common to CSE, IT)

Time: 2 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

1.a) Show that  $\sim(p \vee (\sim p \wedge q))$  and  $(\sim p \wedge \sim q)$  are logically equivalent.

b) Show that  $\sim(p \wedge q), (\sim q \vee r) \sim r \Rightarrow (\sim p)$ .

[8+7]

2. Prove that  $(\forall x)(P(x) \vee Q(x)) \Rightarrow (x)P(x) \vee (\exists x)Q(x)$ .

[15]

3. Show that congruence modulo  $m$  is an equivalence relation on integers.

[15]

4.a) A relation  $R$  on  $A$  is symmetric if and only if  $R = R^{-1}$ .

b) A relation  $R$  on  $A$  is reflexive if and only if  $R^{-1}$  is reflexive.

[7+8]

5. Prove by Mathematical induction that  $6^{n+2} + 7^{2n+1}$  is divisible by 43 for each positive integer  $n$ .

[15]

6. Prove that, if  $F_n$  is the  $n^{\text{th}}$  Fibonacci number, then  $F_n = \frac{1}{\sqrt{5}} \left[ \left( \frac{1+\sqrt{5}}{2} \right)^{n+1} - \left( \frac{1-\sqrt{5}}{2} \right)^{n+1} \right]$  for

all integers  $n \geq 0$ .

[15]

7. Solve the recurrence relation  $a_n - a_{n-1} - 12a_{n-2} = 0, a_0 = 0, a_1 = 1$ .

[15]

8.a) State and prove fundamental theorem of graph theory.

b) Prove that a complete graph  $K_n$  is planar if and only if  $n \leq 4$ .

[7+8]

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