Q. Code: 435095

B.E./B.TECH. Degree Examination, December 2020

Third Semester

MA18352-Discrete Mathematics

(Regulation 2018)

Time: Three hours | Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. Which of the following is the contrapositive of 'if two triangles are identical, then they are similar'?
   A) If two triangles are not similar, then they are not identical
   B) If two triangles are not identical, then they are not similar
   C) If two triangles are not identical, then they are similar
   D) If two triangles are not similar, then they are identical

2. In how many ways can 10 examination papers be arranged so that the best and the worst papers never come together?
   A) $8\times 8!$
   B) $9\times 8!$
   C) $8\times 9!$
   D) $7\times 9!$

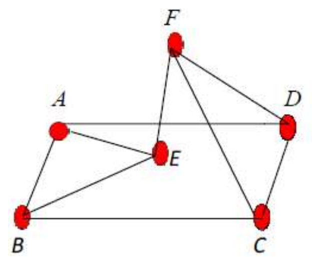
3. Which of the following statements for a simple graph is correct?
   A. Every path is a trail
   B. Every trail is a path
   C. Every trail is a path as well as every path is a trail
   D. None of the mentioned

4. Let S={1,2,3,4,5,6,7,8,9} and relation $R=\{(x,y)/x+y=10\}$, then R is
   A) Reflexive
   B) Transitive
   C) Symmetric
   D) Anti-symmetric

5. State which rule of inference is the basis of the following argument: "It is below freezing and raining now. Therefore, it is below freezing now."

6. Find the recurrence relation for the Fibonnaci sequence?

7. Check whether the given graph is regular? Justify your answer.



8. Show that absorption laws are valid in a Boolean Algebra.

PART B - (4 X16 = 64 marks)

09. (a) (i) Check whether $\neg(p \vee (q \wedge r)) \leftrightarrow ((p \vee q) \wedge (p \rightarrow r))$ is a tautology. **(8)**

(ii) Find the PCNF and PDNF of the following statement $p \wedge \neg(q \wedge r) \vee (p \rightarrow q)$. **(8)**

(OR)

(b) (i) Without using truth table prove the logical proposition $(\neg p \vee q) \wedge (p \wedge (p \wedge q)) \equiv p \wedge q$ **(8)**

(ii) Show that the premises "One student in this class knows how to write programs in JAVA" and "Everyone who knows how to write programs in JAVA can get a high-paying job" imply the conclusion "Someone in this class can get a high-paying job". **(8)**

10. (a) (i) Use mathematical induction to show that $\sum_{k=1}^{n}(2k-1)^2 = \dfrac{n(2n-1)(2n+1)}{3}$. **(8)**

(ii) How many positive integers can be formed using the digits 3,4,4,5,5,6,7 which exceeds 5000000. **(8)**

(OR)

(b) (i) Using generating function solve the recurrence relation $a_n - 7a_{n-1} + 6a_{n-2} = 0$ where $n \geq 2$, $a_0 = 8$ and $a_1 = 6$. **(8)**

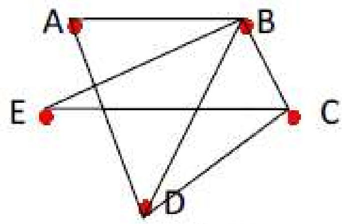
(ii) In a survey of 100 students, it was found that 40 studied Mathematics, 35 studied Chemistry, 64 studied Physics, one all three subjects, 25 Mathematics and Physics, 20 Physics and Chemistry, 3 Mathematics and Chemistry. Find the number of students who studied only Chemistry and number of students who studies none of these subjects. **(8)**

11. (a) (i) Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges. **(8)**

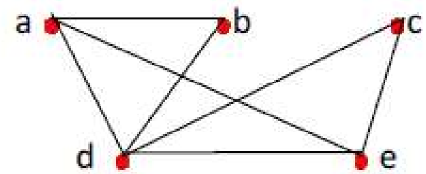
(ii) Prove that a connected multigraph has an Euler Tour if and only if each of its vertices are of even degree. **(8)**

(OR)

(b) (i) Determine whether the graphs G and H are isomorphic. **(10)**



Graph G



Graph H

(ii) Represent the Konigsberg Bridge problem by means of graph. Does the problem have a solution? **(6)**

12. (a) (i) Let A={3, 5, 9, 15, 24, 45} and the relation $\leq$ is defined as $a \leq b$ if a divides b. **(8)**

i) Draw its Hasse diagram.

ii) Find its maximum, minimum, greatest and least elements when they exist.

(ii) For any $a, b, c \in L$, where $(L, \leq)$ is a Lattice, prove that $a \leq c$, if and only if $a \vee (b \wedge c) \leq (a \vee b) \wedge c$. **(8)**

(OR)

(b) (i) State and prove Isotone properties in a lattice. **(8)**

(ii) Show that every chain is a distributive lattice. **(8)**