Code No: 112

VASAVI COLLEGE OF ENGINEERING *(Autonomous)* HYDERABAD
MCA. I/III I-Semester(Main) Examinations, March-2015

Discrete Mathematics

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** questions from **Part-B***

Part-A (Marks: 10 X 2=20)

1 Use Equivalences to prove that $P\rightarrow(Q \wedge R) \Leftrightarrow (P\rightarrow Q) \wedge (P\rightarrow R)$

2 Express the statement "Every Student in this class has studied Mathematics" as a Universal Quantifier.

3 Use mathematical Induction to prove that 5 divides $n^5 - n$ whenever n is a non negative integer.

4 Define the terms: On-to function and One-to-One function.

5 In how many ways can the letters in ARRANGMENT be arranged so that there are exactly two pairs of consecutive identical letters?

6 Find the coefficient of x^{72} in $(x^8+x^9+x^{10}+\ldots..)^8$.

7 Define the following terms: Semi group and monoid.

8 What are the elementary properties of Groups?

9 What are Planar graphs?

10 Define a Tree.

Part-B (Marks: 5 X 10=50)
(All bits carry equal marks)

11 (a) Establish the validity of the following argument by the method of proof by contradiction

$p\rightarrow(q \wedge r)$

$r\rightarrow s$

$\neg (q \wedge s)$

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$\therefore \neg p$

(b) Prove or disprove the validity of the following arguments using rules of inference:

No Junior or Senior is enrolled in a Physical education class.
Mary Gusberti is enrolled in a Physical education class.
Therefore Mary Gusberti is not a senior.

12 (a) Draw the Hasse Diagram of $\{P(A), \subseteq\}$. Where A is any set. what are the greatest and least elements?

(b) Let F: $R\rightarrow R$ be given by $f(x) = x^3 + 1$ find f^{-1}.

13 (a) How many permutations can be made with letters of the word CONSTITUTION?

(b) Using generating function, solve the $y_{n+2} - 4y_{n+1} + 3y_n = 0$, given $y_0 = 2$, $y_1 = 4$.

14 (a) Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 0$ where $a_0=2$ and $a_1=5$,$n\geq0$.

(b) Show that for any group G is abelian iff $(ab)^2 = a^2 b^2$ for all a, b € G.

15 (a) Show that K3,3 is non planar.

(b) Explain Welsh and Powell Graph Coloring Algorithm.

16 (a) Show that a simple connected planar graph with 8 edges and 13 vertices cannot be colored with 2 colors.

(b) How many integers between 1 and 1000 inclusive have the sum of the digits?

i) Equal to 7 ii) Less than 10

17 (a) Use Truth tables to verity the following logical equivalences:

i) $p\rightarrow(q \vee r) \Leftrightarrow [\neg r\rightarrow(p\rightarrow q)]$

ii) $[(p \vee q) \rightarrow r] \Leftrightarrow [(p\rightarrow r) \wedge (q\rightarrow r)]$

(b) Write a short note on Cyclic Groups.

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