Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

THIRD SEMESTER B.TECH (CS/IT/CC ENGINEERING) MAKE UP EXAMINATIONS, DECEMBER 2017

SUBJECT: ENGINEERING MATHEMATICS -III

[MAT -2105]

REVISED CREDIT SYSTEM

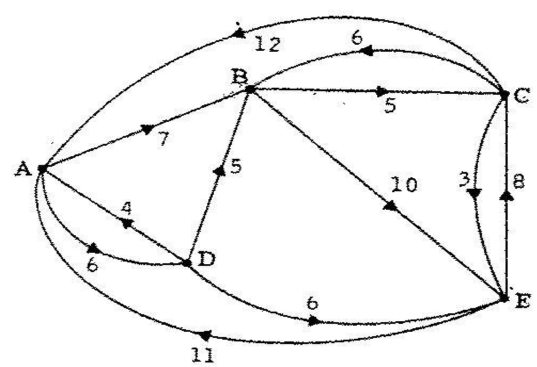
(28/12/2017)

Time: 3 Hours　　　　　　　　　　　　　　　　MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- All questions carry equal marks.

1A.	Let a, b, c be elements in a Lattice $\langle A, \leq \rangle$. Show that , if $a \leq b$, then $a \vee (b \wedge c) \leq b \wedge (a \vee c)$	**3**
1B.	Show that number of partitions of n is equal to number of partitions of 2n with exactly n parts.	**3**
1C.	Prove that $(\exists x)(P(x) \wedge Q(x)) \Rightarrow (\exists x)P(x) \wedge (\exists x)Q(x)$ Is the converse true? Justify your answer.	**4**
2A.	Given n = 5 and the five marks 1, 2, 3, 4, 5 what are the 50^{th} and 100^{th} permutations in the following order a) Lexicographical b) Fike's ordering.	**3**
2B.	Show that the proportion of permutations of {1, 2, 3,…..,n} which contain no consecutive pair (i, i + 1), for any i is approximately $\frac{(n+1)}{ne}$.	**3**
2C.	Show that a (p, q) graph G is a tree if and only if it is acyclic and $p = q + 1$	**4**
3A.	Let H and K be subgroups of a group G. Show that $H \cap K$ is a subgroup of G. Is $H \cup K$ a subgroup of G ?	**3**
3B.	Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises	**3**

	$P \vee Q, Q \to R, P \to M$, and $\neg M$.	
3C.	Let $\langle A, \vee, \wedge, - \rangle$ be a finite Boolean algebra. Let b be any non zero element in A and $a_1, a_2, \ldots, a_k$ be all the atoms of A such that $a_i \le b$. Prove that $b = a_1 \vee a_2 \vee \ldots \ldots \vee a_k$ is the unique way to represent b as join of atoms.	**4**
4A.	If a number has only two different prime factors p_1 and p_2 show that f(n). the number of possible integers less than n and prime to n, is given by $f(n) = n\,(1 - \frac{1}{p_1})(1 - \frac{1}{p_2})$	**3**
4B.	Show that for any graph G either G or $\bar{G}$ is connected. Hence, show that every self complementary graph is connected.	**3**
4C.	Let G be a group and H be a subgroup of G . Show that any two right cosets of H in G are either identical or disjoint. Also, show that any two right cosets of H in G have the same number of elements.	**4**
5A.	Show that if a lattice is distributive then for elements a, b, c $(a \wedge b) \vee (b \wedge c) \vee (c \wedge a) = (a \vee b) \wedge (b \vee c) \wedge (c \vee a)$	**3**
5B.	Let $E(x_1, x_2, x_3) = \overline{\overline{(x_1 \vee x_2)} \vee (\overline{x_1} \wedge x_3)}$ be a Boolean expression over the two valued Boolean algebra. Write $E(x_1, x_2, x_3)$ in both disjunctive and conjunctive normal forms.	**3**
5C.	Define a distance matrix. Write a distance matrix and find the best distance from the point C to A, B, D and E. 	**4**