MID TERM EXAMINATION

SUBJECT: ENGINEERING MATHEMATICS –III(MAT 2155) (OCT 2020)

Instructions:

1. Write your **Name, Roll No, Registration No** and put **signature on the top of the answer sheet.**

2. Scan your answer sheet as **PDF file** and name the file as **Roll No. <space> Name <space> Registration No.**

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1. Let P be the set of all positive factors of 90, and let / denote the 'divides' relation. Then the poset (P, /) a Boolean lattice? Justify.

2. Draw a Hasse diagram for the POSET(S,R) where $S = \{1,2,6,8,12,18,48,72,108,144,216,432\}$ and R be the relation defined as aRb if and only if a divides b for all $a, b \in S$. Also, find the length of the longest chain.

3. Check whether the following are groups. Justify your answer.
   (i) $(G, *)$ where $G = \{1, 2, 4, 8\}$, and $*$ denotes multiplication modulo 12. That is, a$*$b=Remainder obtained when ab is divided by 12.
   (ii) (G, Δ) where $G = \{6,12,18,24\}$, and Δ denotes multiplication modulo 30.

2+2+2=6M

4. Show that the number of partitions of n in which odd parts are not repeated but even parts can occur any number of times is equal to the number of partitions of n in which every part is either odd or a multiple of 4.

5. Let a, b, c be elements in a lattice $(A, \leq)$. Show that, $a \leq b$ if and only if $a \vee (b \wedge c) \leq b \wedge (a \vee c)$.

3+3=6M

6. If k students seated around a circular table are to be assigned one question each from a set of n questions, then use the principle of inclusion and exclusion to show that the number of ways of doing so with no two adjacent students getting the same question is $(n-1)^k + (-1)^k(n-1)$.

7. Write both CNF and DNF form for the Boolean expression $E(x_1, x_2, x_3, x_4) = [(\overline{x_1} \wedge \overline{x_2} \wedge x_4) \vee (\overline{x_1} \wedge x_2 \wedge \overline{x_3})] \wedge (x_2 \wedge \overline{x_3} \wedge \overline{x_4})$ over the two valued Boolean algebra $\{\{0,1\}, \wedge, \vee, -\}$.

4+4=8M