5 a. Define partial order relation R defined on the set A. Let A = {1, 2, 3, 4, 6, 12}, define the relation R by aRb, if and only if a divides b. Prove that R- is a partial order on A, draw Hasse diagram for the relation. **(06 Marks)**

b. Consider A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}. The relation R is defined as (x, y) ∈ R, if and only if x – y is multiple of 5. Verify that R- is an equivalence relation. **(07 Marks)**

c. Let A = {1, 2, 3}, and B = {1, 2, 3, 4}. The relations R and S from A to B are represented by the matrices.

$$M_R = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}, \quad M_S = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

Determine the relations $\overline{R}$, $\overline{S}$, $R \cup S$, $R \cap S$, S^c and their matrix representations. **(07 Marks)**

6 a. Let A = {1, 2, 3, 4, 6} and R be the relation on A defined by aRb if and only if a is multiple of b. Represent the relation R as a matrix and draw its diagraph. **(06 Marks)**

b. Let A = {a, b, c}, and R and S be relations on A whose matrices are given as

$$M_R = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}; \quad M_S = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

Find the composite relations ROS, SOR, ROR, SOS and their matrices. **(07 Marks)**

c. Let A = {1, 2, 3, 4, 5}. Define a relation R on A × A by (x_1, y_1) R(x_2, y_2) if and only if $x_1 + y_1 = x_2 + y_2$

i) Verify that R- is an equivalence relation on A × A.

ii) Determine the equivalent classes [(1, 3)], [(2, 4)] and [(1, 1)]. **(07 Marks)**

7 a. The probability distribution function P(X) of a variate X is given by the following table.

X:	0	1	2	3	4	5	6
P(X):	K	3K	5K	7K	9K	11K	13K

i) For what value of K, above data represent a valid probability distribution.

ii) Find P(X < 4), P(X ≥ 5) and P(3 < X ≤ 6). **(06 Marks)**

b. Given 2% of fuses manufactured by a firm are defective. Find the probability that a box containing 200 fuses has

i) At least one ii) 3 or more iii) exactly two, defective fuses. **(07 Marks)**

c. In a test on electric bulbs, it was found that the life of a particular brand was distributed normally with an average life of 2000 hours and standard deviation of 60 hours. If a firm purchases 2500 bulbs find the number of bulbs that are likely to last for

i) More than 2100 hrs

ii) Less than 1950 hrs

iii) Between 1900 to 2100 hrs. **(07 Marks)**

8 a. For the standard normal distribution of a random variable Z, evaluate the followings:

i) P(0 ≤ z ≤ 1.45) ii) P(-3-40 ≤ z ≤ 2.65) iii) P(-2.55 ≤ z ≤ -0.8) iv) P(z ≤ - 3.35). **(06 Marks)**

b. The length of a telephone conversation has an exponential distribution with a mean of 3-minutes. Find the probability that a call ends.

i) in less than 3-minutes ii) taken between 3 and 5 minutes. **(07 Marks)**

c. A random variable X has the following probability function for various values of x

x:	0	1	2	3	4	5	6	7
p(x):	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

i) Find k ii) evaluate p(x < 6), p(x ≥ 6), p(3 < x ≤ 6) **(07 Marks)**