CSM – 69/17

Statistics

Paper – II

Time : 3 hours

Full Marks : 300

The figures in the right-hand margin indicate marks.

Candidates should attempt Q. No. 1 from Section – A and Q. No. 5 from Section – B which are compulsory and any ***three*** *of the remaining questions selecting at least* ***one*** *from each Section.*

SECTION – A

1. Solve any **three** of the following :

   (a) Describe single sampling plan for attributes. Mention the expression for OC and ASN functions. Indicate its limitations. 20

   (b) Define reliability function. When the failure distribution is continuous, prove that reliability function uniquely determines the distribution of failure time. 20

(c) Describe the components of time series. Explain any one procedure of determining trend. 20

(d) Explain the functions of central statistical organization. 20

2. (a) Explain the construction of $\bar{\chi}$ and R Chart. 30

(b) Distinguish between p and np chart and explain the construction of any one of the charts. 30

3. (a) For the following distributions derive an expression for the reliability function :

(i) Exponential distribution

(ii) Weibull distribution

Examine whether the exponential distribution belongs to I. F. R./D. F. R. class. 30

(b) Distinguish between type I and type II censoring. When the failure time distribution is exponential under type II censoring, obtain the maximum likelihood estimator of the parameter. 30

4. (a) Define the following :

(i) AR model

(ii) MA model

(iii) ARIMA model

Explain how do you determine the orders of autoregressive and moving average process. 30

(b) Explain the tests that have to be satisfied by an ideal index number. Examine whether Laspeyre's index number satisfies these tests. 30

SECTION – B

5. Solve any **three** of the following :

(a) Describe two phase procedure of solving a LPP. 20

(b) Define a Markov chain. Explain its properties. 20

(c) Describe the components of a life table. Distinguish between complete and abridged life table. 20

(d) What is IQ score ? Indicate its scores. Distinguish between the following : 20

(i) Z-score

(ii) Standard score

(iii) T-score

(iv) Peroentile scores

6. (a) Solve the following LPP by simplex method : 30

Max. $Z = 3X_1 + 2X_2 + 5X_3$

Subject to $X_1 + 2X_2 + X_3 \leq 430$

$3X_1 + 2X_3 \leq 460$

$X_1 + 4X_2 \leq 420$

$X_1, X_2, X_3 \geq 0$

(b) What is sensitivity analysis ? Explain the need of the same. 30

7. (a) Describe Poisson process. Indicate its uses. 30

(b) Explain the following :

(i) M / M / 1 queue

(ii) G / M / 1 queue

(iii) M / G / 1 queue

Under stationary condition derive the expression for expected number of persons in the queue. 30

8. (a) Explain the following terms : 30

(i) Crude birth rate

(ii) Age specific birth rate

(iii) General fertility rate

(iv) Gross reproduction rate

(v) Net reproduction rate

(vi) Standardized birth rate

(b) Describe how to fit a logistic growth model. 30