This question paper contains 3 printed pages.

8056 *Your Roll No.* .....

B.Sc. / III **D**

MATHEMATICAL SCIENCES— Paper VI

(Operational Research)

(Statistical Quality Control and Forecasting)

Time : 3 hours *Maximum Marks* : 30

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer any five questions.
All questions carry equal marks.

1. Describe various components of time series and explain the need to analyze them 6

2. (a) Explain the fitting of Parabolic and Exponential trend in a given time series data by Principle of Least Square. 3

   (b) Describe single exponential smoothing method for forecasting time series. 3

3. Describe "Deseasonalisation of data". Estimate the influence of trend and seasonal variations in the following data: 6

P.T.O.

Year/Quarter	*I*	*II*	*III*	*IV*
2009	11	35	29	57
2010	14	51	33	74
2011	19	57	43	78

4. (a) Distinguish between Additive and Multiplicative decomposition model of time series. 3

   (b) Explain the working and basic principle underlying the control chart in detail. How is it useful in manufacturing and service industries? 3

5. Distinguish between variable and attribute control charts. Explain the construction of attribute control charts control limits by describing the distribution on which it is based. 6

6. (a) A fair percentage of a certain product requires costly work operations to change a certain quality characteristic. Rework is possible whenever the quality characteristic falls above the upper specification limit. If the value falls below the lower specification limit, the product must be scrapped. X-bar and R charts have been maintained for 50 subgroups of 5 each. The specifications for the quality characteristic are 119± 10. The process appears to be in statistical control with $\bar{\bar{X}}$ as 124 and $\bar{R}$ as 5. On the assumption that the quality characteristic is normally distributed, approximately what percentage of defective articles is

being produced? How much of this can be reworked? 4

(b) State the control limits for S chart. How can the standard deviation of the process be estimated from it? 2

7. Explain single sampling plan for attributes. Derive an expression for the following in single sampling plan for attribute:

(a) Producer's risk

(b) Consumer's risk

(c) AOQ and AOQL

(d) ATI.

Determine the procedure for finding n (sample size) and c (acceptance sample no.). 6