

STATISTICS

(Paper II)

Time Allowed : Three Hours
Maximum Marks : 250

QUESTION PAPER SPECIFIC INSTRUCTIONS

(Please read each of the following instructions carefully before attempting questions)

There are EIGHT questions divided in two Sections.

Candidate has to attempt FIVE questions in all.

Question Nos. 1 and 5 are compulsory and out of the remaining, any THREE are to be attempted choosing at least ONE question from each Section.

The number of marks carried by a question/part is indicated against it.

Wherever any assumptions are made for answering a question, they must be clearly indicated.

Word limit in questions, wherever specified, should be adhered to.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

SECTION 'A'

1. (a) What is meant by Statistical Quality Control (SQC)? What is its main purpose? Give its uses. Also mention different tools for SQC. 10
 - (b) What are the different methods for determining Reliability? Explain any two of them and also give their merits and demerits. 10
 - (c) Explain different steps in the preparation of Control Charts. 10
 - (d) Give any three definitions of Operations Research. What are the advantages and disadvantages of operations research models? 10
 - (e) What is Linear Programming? Give its advantages and limitations. 10
 2. (a) Explain Double sampling Plan and develop expression required for drawing OC curve in Double sampling Plan. 15
 - (b) Explain the procedure for drawing the 5-points A S N curve for the sequential sampling plan. 15
 - (c) In welding of seams, number of defects that were identified in one seam each hour are given below: 2-1-2013
- | | | | | | | | | | | | | |
|------|------|------|------|-------|-------|---------|------|------|------|------|------|------|
| 6 am | 7 am | 8 am | 9 am | 10 am | 11 am | 12 noon | 1 pm | 2 pm | 3 pm | 4 pm | 5 pm | 6 pm |
| 2 | 4 | 7 | 3 | 1 | 4 | 8 | 9 | 5 | 3 | 7 | 11 | 6 |
- 3-1-2013
- | | | | | | | | | | | |
|------|------|------|------|-------|-------|---------|------|------|------|------|
| 6 am | 7 am | 8 am | 9 am | 10 am | 11 am | 12 noon | 1 pm | 3 pm | 4 pm | 5 pm |
| 4 | 9 | 9 | 6 | 4 | 3 | 9 | 7 | 4 | 7 | 12 |
- Draw the control chart for number of defects and give your conclusion. 20
3. (a) Four counters are being opened on the frontier of a country to check the passports and necessary papers of the tourists. The tourists choose the counter at random. If the arrivals at the frontier are Poisson at the rate λ and the service time is exponential with parameters $\lambda/2$, what is the steady state average queue at each counter? 10
 - (b) Solve the following game problem graphically:
- | | | | | |
|-------------------------|----|----|-----|----|
| Player B → / Player A ↓ | I | II | III | IV |
| I | 8 | 5 | -7 | 9 |
| II | -6 | 6 | 4 | -2 |
- 10

- (c) A cement factory manager is considering the least way to transport cement from his three factories A, B and C to depots P, Q, R and S. The weekly production and demands along with transportation costs are given below. What should be the distribution programme?

Factory	Depot P	Depot Q	Depot R	Depot S	Production
A	10	8	7	12	500
B	12	15	6	10	500
C	8	10	12	14	900
demand	700	550	450	300	

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4. (a) A truck owner finds from his past records that the maintenance cost of a truck (whose purchase price is Rs. 30,00,000) during the first 8 years of its life and the resale price at the end of each year is as follows:

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	360000	480000	600000	720000	840000	960000	1080000	1200000
Resale Price (Rs.)	2000000	1500000	1000000	800000	700000	600000	500000	400000

In which year is the replacement due?

10

- (b) What is Assignment Problem? With usual notation give its mathematical formulation. Compare this with Mathematical form of Transportation Model.

10

- (c) Solve the following LPP:

$$\text{Maximise } Z = 8x_1 - 4x_2 \text{ Subject to } 4x_1 + 5x_2 \leq 20, -x_1 + 3x_2 \geq -23$$

where $x_1 \geq 0$ and x_2 is unrestricted in sign.

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SECTION 'B'

5. (a) Define Time Series. Write its components and explain them. 10
- (b) What are the different measures of Mortality? Explain briefly. 10
- (c) What is cost of living index numbers? Mention the main steps in the construction of cost of living Index. What are its uses? 10
- (d) What is Validity of Test Scores? How you will calculate Validity? Also make comparison with the concept of reliability. 10
- (e) What are Hospital Statistics? How they are useful? 10

6. (a) Complete the following Table:

Age in years	l_x	d_x	q_x	p_x	L_x	T_x	E_x^0
11	12000	?	?	?	?	?	?
12	8000	?	?	?	?	?	?
13	6000	?	?	?	?	?	?
14	4000				3000	?	?

25

- (b) Explain the Logistic growth curve for the population growth. Give any two methods of fitting the Logistic Growth Curve. 15
- (c) What is the problem of multicollinearity? What are its consequences? 10
7. (a) Briefly explain the Schematic representation of the BOX-JENKINS methodology for time series modelling. 20
- (b) Explain any three main sources of demographic data mentioning their limitations and uses. 15
- (c) Write briefly on methods of collecting Agricultural Statistics in India. Also mention its shortcomings. 15
8. (a) Clearly explain the following fertility rates and also give their advantages and disadvantages: (i) Crude Birth Rate (ii) General Fertility Rate and (iii) Age Specific Fertility 15

Rates

- | | | |
|------------|--|-----------|
| (b) | Explain how Fertility can be estimated as an application of Stable Population Theory. | 10 |
| (c) | Show that Marshall-Edgeworth Index number lies between Laspeyre's and Paasche's Index numbers. | 10 |
| (d) | What is CSO? Explain and mention its main functions. | 15 |