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MSTE-001

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

01512

December, 2018

MSTE-001 : INDUSTRIAL STATISTICS-I

Time : 3 hours *Maximum Marks : 50*

Note :

(i) *All questions are **compulsory**. Questions no. 2 to 5 have internal choices.*

(ii) *Use of scientific calculator is allowed.*

(iii) *Use of Formulae and Statistical Tables Booklet for PGDAST is allowed.*

(iv) *Symbols have their usual meanings.*

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1. State whether the following statements are *True* or *False*. Give reasons in support of your answers. *5×2=10*

(a) If average number of defects in an item is 9, the upper control limit of the suitable chart will be 18.

(b) If the probability of making a decision about acceptance or rejection of a lot on the first random sample of size 10 is 0·60, the average sample number for the double sampling plan will be 25 where the size of second random sample is 15.

(c) Two independent components of a system are connected in series configuration. If the reliabilities of these components are 0·1 and 0·3 respectively, then the reliability of the system will be 0·65.

(d) If the value of game is 7, it is fair.

(e) The C-chart is used to control the number of defectives in a process.

2. A food company puts mango juice into cans advertised as containing 200 ml of juice. Twenty random samples of 4 cans each were drawn at an interval of 30 minutes and quantity of juice per can drained immediately after filling is given below :

Sample No.	Quantity of Juice			
	I	II	III	IV
1	215	212	213	220
2	210	208	208	214
3	208	215	217	210
4	212	217	211	212
5	218	213	215	204
6	220	216	214	220
7	215	219	223	217
8	213	223	214	216
9	209	208	218	205
10	206	210	224	220
11	205	212	220	215
12	203	215	218	218
13	206	218	212	210
14	212	209	215	218
15	215	215	206	216
16	218	217	208	213
17	213	216	205	204
18	210	220	208	210
19	205	215	210	212
20	206	214	212	214

Construct $\bar{X}$ and R-charts to control the quantity of mango juice for filling and comment on the state of the process. *10*

OR

To monitor the manufacturing process of mobile phones, a quality control inspector randomly selected 100 mobile phones from the production line each day over 15 days. These were inspected and the number of defectives found each day are given below :

Day	No. of defectives	Day	No. of defectives
1	3	9	3
2	6	10	0
3	4	11	6
4	6	12	15
5	20	13	5
6	2	14	7
7	6	15	6
8	7		

(i) Determine the centre line and control limits for the suitable chart.

(ii) Draw the chart and state whether the process is under control. If not, draw the revised chart. *4+6*

3. A shoe manufacturing company supplies shoes in lots of size 150 to a buyer. A single sampling plan with n = 10 and c = 1 is being used for the lot inspection. The company and the buyer decide that AQL = 0·08 and LTPD = 0·16.

If there are 15 defective shoes in each lot, compute :

(i) Probability of accepting the lot.

(ii) Producer's risk and consumer's risk.

(iii) Average Outgoing Quality (AOQ), if the rejected lots are screened and all defective shoes are replaced by non-defectives.

(iv) Average Total Inspection (ATI). *2+4+2+2*

OR

For the sampling plan N = 1200, n = 64 and c = 1, determine the probability of acceptance of the following lots :

(i) 0·5% defectives

(ii) 0·8% defectives

(iii) 1% defectives

(iv) 2% defectives

(v) 4% defectives

(vi) 10% defectives

Also draw OC curve. *10*

4. Solve the two-person zero-sum game having the following payoff matrix for player A : *10*

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	4	3	2	1
	A_2	6	4	5	0
	A_3	1	2	0	3

OR

Consider the following payoff table :

		Course of Action			
		A_1	A_2	A_3	A_4
States of Nature	N_1	400	900	900	1000
	N_2	200	400	700	– 300
	N_3	600	200	500	700

Identify the optimum course of action under :

(i) Optimistic Criterion

(ii) Pessimistic Criterion

(iii) Hurwitz Criterion

(iv) Regret Criterion *10*

5. The failure density function of variate T is given below :

$$f(t) = \begin{cases} 0{\cdot}011\, e^{-0{\cdot}011t}, & t \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

Calculate :

(i) Reliability of the component

(ii) Reliability of the component for a 100 hour mission time

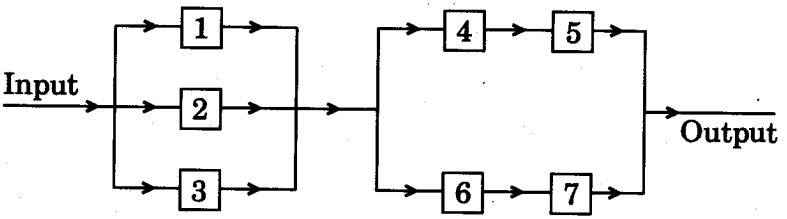
(iii) Mean Time to Failure (MTTF)

(iv) Median of T

(v) Life of the component, if the reliability of 0·96 is desired *10*

OR

Evaluate the reliability of the system for which the reliability block diagram is shown in the figure given below :



Assume that all components are independent and the reliability of each component is given as follows :

$R_1 = 0{\cdot}40$, $R_2 = 0{\cdot}30$, $R_3 = 0{\cdot}60$, $R_4 = 0{\cdot}80$,

$R_5 = 0{\cdot}85$, $R_6 = 0{\cdot}60$, $R_7 = 0{\cdot}70$,

where R_i (i = 1, 2, ..., 7) denotes the reliability of component i. *10*