Total Pages—5

B.Tech-6
SM & DE

Set-1

Full Marks : 70

Time : 3 hours

Answer **Q. No. 1** and any **five** from the rest

The figures in the right-hand margin indicate marks

Statistical Tables may be provided

1. Answer the following : 2×10

(*a*) Differentiate between stratified sampling and multi-stage sampling.

(*b*) State the difference between estimation and test of hypothesis.

(*c*) State the conditions when binomial distribution can be approximated by Poisson distribution.

(*d*) Name two nominal the best type of quality characteristics.

(*e*) What is quality loss function ?

(*Turn Over*)

(*f*) What are Type I and Type II errors ?

(*g*) What is Operating Characteristic Curve ?

(*h*) Develop a Greeco-Latin square experimental plan.

(*i*) Differentiate between quality and reliability.

(*j*) State the basic assumptions for analysis of variance.

2. The followings are the average weekly losses of worker-hours in 10 industrial plants before and after a certain safety program was put into operation :
45 and 36, 73 and 60, 46 and 44, 124 and 119, 33 and 35, 57 and 51, 83 and 77, 34 and 29, 26 and 24, and 17 and 11. Use the 0·05 level of significance to test whether the safety program is effective. 10

3. A study shows that 16 of 200 fractions produced on one assembly line required extensive adjustments before they could be shipped, while the same was true for 14 of 400 tractors produced by another assembly line. At the 0·01

(*Continued*)

significance level, does this support the claim that the second production line does superior work ? 10

4. Four methods are under development for making dises of a super conducting material. Fifty dises are made by each method and they are enrolled for super conductivity when cooled with liquid nitrogen.

	Method 1	Method 2	Method 3	Method 4
Super conductors	31	42	22	25
Failures	19	8	28	25

Perform a chi-square test at 5% significance level. If there is a significant difference between the proportions of super-conductions produced ? 10

5. An experiment was performed to judge the effect of four different fuels and two different types of launchers on the range of a certain rocket. List, on the basis of the following data (in nautical units) whether there are significant

(*Turn Over*)

differences (a) among the means obtained for the fuels, and (b) between the means obtained for the launchers. Use 0·05 level of significance. 10

	Fuel I	Fuel II	Fuel III	Fuel-IV
Launcher X	62·5	49·3	33·8	43·6
Launcher Y	40·4	39·7	47·4	59·8

6. To determine the effect on exit dust loading in a precipitator, the following measurements were made :

Total flow (m^3/m)	Exit dust loading (grains per cubic meter in fine gas)				
200	1·5	1·7	1·6	1·9	1·9
300	1·5	1·8	2·2	1·9	2·2
400	1·4	1·6	1·7	1·5	1·8
500	1·1	1·5	1·4	1·4	2·0

use 0·05 level of significance, test whether the flow through the precipitation has an effect on the exist dust loading. 10

7. State, in details, any two quality improvement and monitoring tools. 5 + 5

8. A Latin-square design was used to compare the bond strengths of gold semiconductor lead wires bonded to the lead terminal by five different methods A, B, C, D and E the bonds were made by five different operators and the devices were encapsulated using five different plastics, with the following results, expressed as formals of force required to break the bond :

		Operator				
		O1	O2	O3	O4	O5
Plastic	P_1	$A_{3\cdot0}$	$B_{2\cdot4}$	$C_{1\cdot9}$	$D_{2\cdot2}$	$E_{1\cdot7}$
	P_2	$B_{2\cdot1}$	$C_{2\cdot7}$	$D_{2\cdot3}$	$E_{2\cdot5}$	$A_{3\cdot1}$
	P_3	$C_{2\cdot1}$	$D_{2\cdot6}$	$E_{2\cdot5}$	$A_{2\cdot9}$	$B_{2\cdot1}$
	P_4	$D_{2\cdot0}$	$E_{2\cdot5}$	$A_{3\cdot2}$	$B_{2\cdot5}$	$C_{2\cdot2}$
	P_5	$E_{2\cdot1}$	$A_{3\cdot6}$	$B_{2\cdot4}$	$C_{2\cdot4}$	$D_{2\cdot1}$

Analyse these bonds at 5% significance levels using ANOVA. 10