LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Com. DEGREE EXAMINATION – **COMMERCE**

THIRD SEMESTER – **APRIL 2016**

ST 3202 - ADVANCED STATISTICAL METHODS

Date: 04-05-2016   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

SECTION A	(10 X 2 = 20 marks)

Answer ALL the questions.

1. State the axioms of probability.

2. Name the methods of sampling.

3. State one tail and two tail test.

4. Distinguish between Type – I and Type –II error

5. Two dice are thrown. Find the probability that the sum of the two dice is greater than 6..

6. What are the control Charts?

7. Distinguish between null and alternative hypothesis.

8. Distinguish between process control and product control.

9. State the advantages of control charts

10. Define Yule's coefficients of attributes.

SECTION B	(5 X 8 = 40 Marks)

Answer any FIVE questions

11. State and prove Baye's theorem.

12. A bag contains four white and six black balls. Two balls are drawn at random. What is the probability that (i) both are white, (ii) both are black, (iii) one white and one black.

13. What is probability sampling? Explain different types of probability sampling.

14. A husband and wife appeared in an interview for two vacancies in the same post. The probability of husband's selection is 1/7 and that of wife is 1/5. What is the probability that (i) both of them will be selected (ii) only one of them will be selected (iii) none of them will be selected.

15. A machine produced 20 defective articles in a batch of 400 . After overhauling it produced 10 defectives in a batch of 300. Has the machine improved? Test at the 5% level of significance.

16. What do you understand by process control? How does it differ from 'Acceptance Inspection?'

17. Out of 8000 graduates in a town, 800 are females and out of 1600 graduate employees 120 are females. Use Chi-square to determine if any discrimination is made in appointment on the basis of sex? Test at 5% level.

18. You are given below the values of sample mean (X) and the range (R) for ten samples of size 5 each. Draw mean and range charts and comment on the state of control of the process.

Sample No: 1   2   3   4   5   6   7   8   9   10

$\overline{X}$: 43   49   37   44   45   37   51   46   43   47

R: 5   6   5   7   7   4   8   6   4   6

You may use the following control chart values for n = 5, A2 = 0.58, D3 = 0 , D4 = 2.11

SECTION   C   (2 X 20 = 40 Marks)

Answer any TWO questions:

19.(a) The average daily sales of 500 branch offices was Rs.150 thousand and the standard deviation Rs.15

Thousand. Assuming the distribution to be normal, find how many branches have sales between
(i)   Rs. 1,20,000 and Rs.1,45,000
(ii)   RS.1,40,000 and Rs.1,60,000

(b) A factory has two machines A and B. Past records show that machine A produces 30% of the total output and machine B the remaining 70%.Machine A produces 5% defectives and machine B produces 1% defective items. An item is drawn at random and to be defective. What is the probability that it was produced
(a) by machine A   (b) by machine B   (10 +10)

20. Construct a control chart for mean and the range for the following data on the basis of fuses, samples of

5 being taken every hour (each set of 5 has been arranged in ascending order of magnitude).

Sample No	1	2	3	4	5	6	7	8	9	10	11	12
	42	42	19	36	42	51	60	18	15	69	64	61
	65	45	24	54	51	74	60	20	30	109	90	78
Samples	75	68	80	69	57	75	72	27	39	113	93	94
	78	72	81	77	59	78	95	42	62	118	109	109
	87	90	81	84	78	132	138	60	84	153	112	136

(Given for n = 5, A2 = 0.58, D3 = 0 and D4 = 2.11)

(b)The following data refer to the number of defectives in 10 samples of 100 items each. Construct an appropriate control chart and interpret the control limits:

16   18   11   18   21   10   20   18   17   21

Do these indicate that the quality characteristic under inspection is under statistical control   (10 +10)

21.(a) An IQ test was administered to 5 persons before and after they were trained. The results are given below:

Candidates	I	II	III	IV	V
IQ before training	110	120	123	132	125
IQ after training	120	118	125	136	121

Test whether the training is effective at 5%level of significance

(b) The following table gives the classification of 100 workers according to sex and the nature of work. Test whether the nature of is work independent of the sex.

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	Skilled	Unskilled
Male	40	20
Female	10	30

$(10 +10)$

22. The following table gives the output of the used three machines are used for a production. On the basis of the outputs, test whether the machines are equally effective. Given that value of F at 5% level of significance $(2,9)df = 4.26$

Machine I	Machine II	Machine III
10	9	20
15	7	16
11	5	10
10	6	14

(20)

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