



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.SC., B.COM., DEGREE EXAMINATION – PHYSICS, MATHEMATICS & COMMERCE

THIRD SEMESTER – APRIL 2017

ST 3205/ ST 3202 - ADVANCED STATISTICAL METHODS

Date: 04-05-2017
09:00-12:00

Dept. No.

Max. : 100 Marks

SECTION A

(10 X 2 = 20 Marks)

Answer ALL questions.

1. Define probability and give an example.
2. State the Central Limit Theorem
3. Two dice are tossed. What is the probability that total is divisible by 3 or 4?
4. Explain the concept of standard error
5. State any four properties of Poisson distribution.
6. State the additional theorem on probability of two events.
7. Differentiate between small samples and large samples.
8. What is hypothesis?
9. State the advantages of Statistical quality control.
10. Distinguish between the c- chart and p- chart.

SECTION B

Answer any FIVE questions

(5 X 8 = 40 Marks)

11. state and prove multiplication theorem on probability.
12. 800 candidates of both sex appeared at an examination. The boys outnumbered the girls by 15 % of the total. The number of candidates who passed exceeded the number failed by 480. Equal number of boys and girls failed in the examination. Prepare a 2x2 table and find the coefficient of association and Comment.
13. A sub-committee of 6 members is to be formed out of a group consisting of 7 men and 4 women calculate the probability that sub-committee will consist of a) exactly 2 women b) at least 2 women.
14. Briefly explain the procedure for testing of hypothesis.
15. The sales manager of a larger company conducted a sample survey in state A and state B taking 400 samples in each state. The results are

	State –A	State - B
Average sales	2500	2200
Standard deviation	400	550

Test whether average sales given is the same in the 2 states at 1% level.

16. The following table shows the distribution of digits in numbers chosen at random from a telephone directory.

Digits:	0	1	2	3	4	5	6	7	8	9
Frequency:	1026	1107	997	966	1075	933	1107	972	964	853

Test whether the digits may be taken to occur equally frequently in the directory.

17. State the advantages and disadvantages of statistical quality control.

18. You are given below the values of sample mean (\bar{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
\bar{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 constants for $n = 5$, $A_2 = 0.58$, $D_3 = 0$, $D_4 = 2.11$

SECTION C

(2 X 20 = 40 Marks)

Answer any TWO questions

19.(a) Students of a class were given an aptitude test. Their marks were found to be normally distributed with mean 45 and standard deviation 10. If 1000 students appeared at the examination, calculate the number of students scoring (i) less than 40 marks and (ii) more than 60 marks.

(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 is found to be defective. What is the probability that it was produced (a) by machine A (b) by machine B.

(10 + 10)

20. (a) A number of school-children were examined for the presence or absence of certain defects of which three chief descriptions were noted; A-development defects; B-nerve signs; C low nutrition. Given the following ultimate frequencies, find the frequencies of the classes defined by the presence of the defects.

$$(ABC) = 57; (\alpha BC) = 78$$

$$(AB\gamma) = 281; (\alpha B\gamma) = 670$$

$$(A\beta C) = 86; (\alpha\beta C) = 65$$

$$(A\beta\gamma) = 453; (\alpha\beta\gamma) = 8310$$

(b) A group of 5 patients treated with medicine A have weight 42, 39, 48, 60 and 41 kgs; A second group of 7 patients from the same hospital treated with medicine B have weight 38, 42, 56, 64, 68, 69 and 62 kgs.

Do you agree with the claim that medicine B increases weight significantly. Test at 5% level

21.(a)The following data is collected on two characteristics:

	Smokers	Non-Smokers
Literate	83	57
Illiterate	45	68

Based on this, test whether there is relation between the habit of smoking and literacy.

(b)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
Samples	42	42	19	36	42	51	60	18	15	69	64	61
	65	45	24	54	51	74	60	20	30	109	90	78
	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 $n = 5$, $A_2 = 0.58$, $D_3 = 0$ and $D_4 = 2.11$)

(10 + 10)

22. Prepare a Two- way ANOVA on the data given below.

Treatment I

	I	II	III
A	30	26	38
B	24	29	28
C	33	24	35
D	36	31	30
E	27	35	33

Treatment I I

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