LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

THIRD SEMESTER – **NOVEMBER 2019**

ST 3205 – ADVANCED STATISTICAL METHODS

Date: 04-11-2019   Dept. No.   Max. : 100 Marks
Time: 01:00-04:00

SECTION - A

Answer ALL questions.   **(10 x 2 = 20 marks)**

1. Write down the formula for Yule's coefficient of association.
2. Define probability.
3. Explain random variable with an example.
4. Write the probability density function of Normal distributions
5. Define a Statistical hypothesis.
6. Write the test statistic for testing the equality of two independent samples.
7. What is level of significance?
8. State any two assumptions of ANOVA.
9. Write any 4 applications of quality control?
10. Write down the control limits for R-chart.

SECTION - B

Answer any FIVE questions   **(5 X 8 = 40 Marks)**

11. The following table gives the condition of home and the condition of a child in 200 homes. Is there any association between the two? Calculate Yale's coefficient of association and coefficient of colligation.

Condition of child	Condition of home	
	Clean	Not Clean
Clean	110	40
Not Clean	40	10

12. A bag contains 4 white and 6 black balls. Two balls are drawn at random. What is the probability that (a) both are white, (b) both are black and (c) one white and one black?
13. State and prove addition theorem of probability.
14. A random sample of 175 tins coconut oil gave an average weight of 4.85 kgs with a standard deviation of 0.31 kg. Do we accept hypothesis that the average weight is 5 kgs per tin at 1% level?
15. A person throws 10 dice 500 times and obtained 2560 times 4, 5 or 6. Can this be attributed to fluctuations in sampling?
16. The following table gives the yields of 12 samples of plot under three varieties of seed.

A	9.3	9.4	9.6	10
B	12.2	11.4	13.2	14.4
C	10.2	8.7	9.7	12.1

Test using analysis of variance whether there is a significant difference in the average yield of seeds.

17. The following table gives the number of defectives items found in 20 successive samples of 100 items each.

2	6	2	4	4	15	0	4	10	18
2	4	6	4	8	0	2	2	4	0

Draw a P-chart and comment on it.

18. A random sample of employees of a large company was selected and the employees were asked to complete a questionnaire. One question asked was whether the employess was in favour of the introduction of flexible working hours. The following table classifies the employees by their response and by their area of work.

Response	Area of work	
	Production	Non – production
In favour	129	171
Not in fovour	31	69

Test whether there is evidence of a significant association between the response and the area of work.

SECTION C

Answer any TWO questions   **(2 X 20 =40 Marks)**

19. Sate and prove Baye's theorem.
20. Values of a variate in two independent samples are given below.

Sample I	5	6	8	1	12	4	3	9	6	10
Sample II	2	3	6	8	1	10	2	8		

Test the significance of the difference between the two sample means and the two sample variance.

21. A farmer applied three types of fertilizers on 4 separate plots. The figure on yield per acre are tabulated below:

Fertilizers	Yield			
	A	B	C	D
Nitrogen	6	4	8	6
Potash	7	6	6	9
Phosphates	8	5	10	9

Find out if the plots are materially different in fertility, as also, if the three fertilizers make any material difference in yields.

22. 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
X – Bar	0.6	0.8	0.6	0.4	-0.2	0	-0.6	0.6	0.4	0
R	3	1	1	3	2	4	3	3	3	4
Sample No	11	12	13	14	15	16	17	18	19	20
X – Bar	0.2	0.4	0.2	0	1	0	0.4	0.8	0.6	0.4
R	5	3	5	2	3	4	3	2	3	6

You may use the following :(for n=5, A2=0.577, D3=0, D4=2.115)

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