Register Number.....

B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2009

Fourth Semester

U07MA402 PROBABILITY AND APPLIED STATISTICS

(Common to Information Technology, Textile Technology, Textile Technology (Fashion Technology) Branches)

Time: Three hours **Maximum Marks: 100**

(Statistical tables, $\bar{X}$, R charts are permitted)

Answer ALL the Questions:-

PART A (20 x 1 = 20 Marks)

1. The ratio of the standard deviation to the mean is known as

(A) Correlation (B) Coefficient of Variation (C) Correlation Coefficient (D) Median

2. The variance of the first 'n' positive integers is

(A) $\frac{1}{12}(n^2-1)$ (B) $\frac{n(n+1)}{2}$ (C) n^2-1 (D) $\frac{n(n+1)(n+2)}{6}$

3. If X and Y are independent, the Corr (X,Y) is

(A) 1 (B) 0 (C) -1 (D) ∞

4. When will be the two regression lines coincident?

(A) $r_{XY}=0$ (B) $r_{XY}=\pm 1$ (C) $r_{XY}=\infty$ (D) $r_{XY}=0.5$

5. What is the chance that a non-leap year contains 53 Sundays?

(A) $\frac{1}{7}$ (B) $\frac{2}{7}$ (C) 1 (D) 2

6. Given $P(A)=\frac{1}{4}, P(B)=\frac{1}{3}$ and $P(A\cup B)=\frac{1}{2}$, then $P\left(A/B\right)=$

(A) $\frac{1}{12}$ (B) $\frac{1}{6}$ (C) $\frac{1}{4}$ (D) $\frac{1}{3}$

7. If $E(X)=0.5$ and Var (X) = 1.25, then Var $(2X+1)$ is

(A) 2 (B) 1 (C) 1.5 (D) 5

8. The rth moment about origin is $\mu_r'=(r+1)!2^r$, variance is

(A) 4 (B) 2 (C) 8 (D) 24

9. If 'X' is a Poisson variate such that $E(X^2)=6$, then $E(X)=$

(A) $\sqrt{6}$ (B) 2 (C) −3 (D) 6

10. Central moment μ_3 of the uniform distribution in the interval is (a,b) is

(A) 0 (B) $\frac{b+a}{2}$ (C) $\frac{(b-a)^2}{12}$ (D) 1

11. In a normal distribution, Mean, Median and Mode are

(A)Equal (B) Not equal (C) 0.5 (D) 0

12. If X_1 follows $N(\mu_1,\sigma_1^2)$ and X_2 follows $N(\mu_2,\sigma_2^2)$, then $X_1 - X_2$ follows

(A) $N(\mu_1-\mu_2,\sigma_1^2-\sigma_2^2)$ (B) $N(\mu_1+\mu_2,\sigma_1^2-\sigma_2^2)$

(C) $N(\mu_1+\mu_2,\sigma_1^2+\sigma_2^2)$ (D) $N(\mu_1-\mu_2,\sigma_1^2+\sigma_2^2)$

13. A random sample of 900 items is taken from a normal population whose mean , variance ar and the sample mean is 4.5 . Test statistic Z is

(A) 1.35 (B) 1.37 (C) 7.5 (D) 3.75

14. A coin is tossed 900 times and head appears 490 times. Also the coin is unbiased. Test statis Z is

(A) 2.64 (B) 0.5 (C) 2.58 (D) 1.96

15. If the degrees of freedom tend to infinity, then chi-square distribution becomes

(A) Normal (B) Exponential (C) Uniform (D) Binomial

16. In a chi-square test, the degrees of freedom for a Poisson distribution is

(A) n -1 (B) n – 2 (C) n – 3 (D) n (n – 1)

17. In a 2×2 Latin Square Design, then the degrees of freedom of sum of squares of errors is

(A) 1 (B) 3 (C) 2 (D) 0

18. The LCL for $\bar{X}$ chart, when each sample is of size 4 and $\bar{\bar{X}} = 10.80$ and $\bar{R} = 0.46$ is

(A) 10.46 (B) 11.14 (C) 0 (D) 1.05

19. Given n =15, $\bar{c} = 3$. The UCL for c-chart is

(A) 11.43 (B) 18.57 (C) 0 (D) 8.20

20. In a 4×5 randomized Block Design, the degrees of freedom of sum of squares between columns is

(A) 19 (B) 3 (C) 5 (D) 4

PART B (5 x 16=80 Marks)

21. (a) (i) Calculate the mean and standard deviation for the following data: (8)

Size of item	6	7	8	9	10	11	12
Frequency	3	6	9	13	8	5	4

(ii) Compute the coefficient of correlation between X and Y using the data: (8)

X	65	67	66	71	67	70	68	69
Y	67	68	68	70	64	67	72	70

(OR)

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(b) (i) Ten competitors in a beauty contest were ranked by three judges as follows: (8)

Judges	Competitors									
A	6	5	3	10	2	4	9	7	8	1
B	5	8	4	7	10	2	1	6	9	3
C	4	9	8	1	2	3	10	5	7	6

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Discuss which pair of judges have the nearest approach to the common taste of beauty.

(ii) Obtain the equations of the lines of regression from the following data: (8)

X	1	2	3	4	5	6	7
Y	9	8	10	12	11	13	14

22. (a) (i) An urn contains 10 white and 3 black balls . Another urn contains 3 white and 5 black balls. Two balls are drawn at random from the first urn and placed in the second urn and then one ball is taken at random from the latter. What is the probability that it is a white ball? (8)

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(ii) A continuous random variable X has a probability density function $f(x) = kx^2e^{-x}$, $x > 0$. Find 'k', mean and variance of X. (8)

(OR)

(b) (i) The first three moments about origin are 5,26,78. Show that the first three moments about 3 are 2, 5, - 48. (8)

(ii) The probability function of an infinite discrete distribution is given by $p(x) = \frac{1}{2^x}$, $x = 1, 2, \ldots$ Find (i) p(X is even) (ii) $p(X \geq 5)$ (iii) p(X is divisible by three) (iv) Mean. (8)

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23. (a) (i) If X and Y are independent Poisson random variables, show that the conditional distribution of X given the value of X+Y is a binomial distribution. (8)

(ii) The time (in hours) required to repair the machine is exponentially distributed with parameter $\lambda = \frac{1}{2}$.

(1) What is the probability that the repair time exceeds 2 hours?
(2) What is the conditional probability that a repair takes atleast 10 hours given tha duration exceeds 9 hours?

(OR)

(b) (i) Find the moment generating function of Geometric distribution .Hence find its mean variance.

(ii) The marks obtained by a number of students in a certain subject are assumed approximately normally distributed with mean 65 and s.d 5. If 3 students are selec random from this group, what is the probability that exactly two of them will have above 70?

24. (a) (i) Two random samples of sizes 400 and 500 showed mean 10.9 and 11.5 respectively. the samples be regarded as drawn from a population with variance 25.

(ii) The nicotine contents in the two random samples of tobacco are given below:

Sample I	21	24	25	26	27	
Sample II	22	27	28	30	31	36

Can you say that the two samples came from the same normal population?

(OR)

(b) In a certain sample of 2000 items, 1400 families are consumers of tea. Out of 1800 Hind families 1236 families consumes tea. Use chi-square test to test whether there is any significant difference between consumption of tea among Hindu and Non-Hindu familie

25. (a) Analyze the variances in the following LSD of yields of paddy where A, B, C, D denote different methods of cultivation:

D122	A121	C123	B122
B124	C123	A122	D125
A120	B119	D120	C121
C122	D123	B121	A122

(OR)

(b) Given below are the values of sample mean $\bar{X}$ and sample range R for 10 samples, each size 5. Draw the appropriate mean and range charts and comment on the state of control the process.

Sample No	1	2	3	4	5	6	7	8	9	10
Mean	43	49	37	44	45	37	51	46	43	47
Range	5	6	5	7	7	4	8	6	4	6

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