SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.Tech - IT
Title of the paper: Probability and Statistics
Semester: V   Max.Marks: 80
Sub.Code: 12501(2003-04-05-06)   Time: 3 Hours
Date: 22-04-2009   Session: AN

PART – A   (10 x 2 = 20)
Answer All the Questions

1. Define: (a) Mutually exclusive (b) Independent events

2. A continuous Random variable X has a. p.d.f $f(x) = 3x^2, 0 \leq x \leq 1$. Find a and b such that
    (a) $P(X \leq a) = P(X > a)$ and   (b) $P(X > b) = 0.05$

3. 20% of the bolts produced in a factory are found to be defective. Find the probability that in a sample of 10 bolts chosen at random exactly two will be defective using Poisson distribution.

4. A typist types 2 letters erroneously for every 100 letters. What is the probability that the 10th letter typed is the 1st erroneous letter?

5. What is rank correlation? Give its formula and also give the correction factor when the ranks are repeated.

6. Can $y = 5 + 2.8x$ and $x = 3-0.5y$ be the regression lines of Y on X and X on Y respectively. Give suitable arguments.

7. What do the letters in the symbolic representation (a/b/c): (d/e) of the queuing model represent.

8. Define the little's formula for the single server model with infinite capacity.

9. Define – Time Series.

10. Find the upper and lower control limits for $\bar{x}$ charts for the following values. $\bar{\bar{x}} = 44.2 \ and \ \bar{R} = 5.8, n = 5$

PART – B   (5 x 12 = 60)
Answer All the Questions

11. State and prove baye's formula.

(or)

12. A Random variable X has the following probability function

X	0	1	2	3	4	5	6	7	8
P(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

(a) Determine the value of a
(b) Find $P(X < 3)$, $P(X \geq 3)$

13. If X follows a binomial distribution, prove that

$$\mu_{k+1} = pq\left[\frac{d}{dp}\mu_k + nk\mu_{k-1}\right]$$

(or)

14. In an Engineering examination, a student is considered to have failed, secured second class, first class, and distinction, according as he scores less than 45%, between 45% and 60%, between 60% and 75% and 75% respectively. In a particular year 10% of the students failed in the examination and 5% of the student got distinction. Find the percentages of the student who have got first class and second class. (Assume normal distribution of marks).

15. From the following data, find
(a) the two regression equations
(b) the coefficient of correlation between the marks in economics and statistics.
(c) The most likely marks in statistics when marks in economics is 30

Marks in economics	25	28	35	32	31	36	29	38	34	32
Marks in	43	46	49	41	36	32	31	30	33	39

statistics									

<div align="center">(or)</div>

16. Fit a parabola of the pattern $Y = a + bX + cX^2$ to the data given below

X	20	40	60	80	100	120
Y	5.5	9.1	14.9	22.8	33.3	46

17. If people arrive to purchase cinema tickets at the average rate of 6 per minute, it takes an average of 7.5 seconds to purchase a ticket. If a person arrives 2 min before the picture starts and if it takes exactly 1.5 min to reach the correct seat after purchasing the ticket,

(a) Can he expect to be seated before the start of the picture?

(b) What is the probability that he will be seated for the start of the picture?

(c) How early must he arrive in order to be 99% sure of being seated for the start of the picture?

<div align="center">(or)</div>

18. State and prove Pollaczek-Khinchine Formula.

19. Apply the method of semi average for determining trend of the following data and estimate the value for 1980

Years	1973	1974	1975	1976	1977	1978
Sales	20	24	22	30	28	32

(Thousand units)

If the actual figure of sales for 1980 is 35,000 units, how do you account for the difference between the figures you obtain and the actual figures given to you?

<div align="center">(or)</div>

20. Altona Tire Company sells its ATC – 50 tires with a 50,000 – mile tread life warranty. Lorrie Ackerman, a quality control engineer with the company, runs simulated road test to monitor the life of then output from the ATC – 50 production process. From each of the last 12 batches of 1,000 tires, she had tested 5

tires and recorded the following result with $\bar{x}$ and R measured in thousands of miles.

Batch	1	2	3	4	5	6	7	8	9	10	11	12
$\bar{x}$	50.5	49.7	50.0	50.7	50.7	50.6	49.8	51.1	50.2	50.4	50.6	50.7
R	1.1	1.6	1.8	0.1	0.9	2.1	0.3	0.8	2.3	1.3	2.0	2.1

(a) Use the data above to help Lorrie construct a $\bar{x}$ chart.

(b) Is the production process in control? Explain.