SATHYABAMA UNIVERSITY
(Established under section 3 of UGC Act, 1956)

Course & Branch: B.Tech – IT
Title of the paper: Probability and Statistics
Semester: VI   Max. Marks: 80
Sub.Code: 12501 (2003/2004/2005/2006)   Time: 3 Hours
Date: 01-11-2008   Session: FN

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

1. If A and B are independent. Show that Ã and B are also Independent.

2. Given the Random Variable X with density function
    $$f(x) = \begin{cases} 2x & 0 < x < 1 \\ 0 & elsewhere \end{cases}$$
    Find the probability density function of $Y = 8X^3$.

3. The mean and variance of a binomial distribution are 4 and $\frac{4}{3}$ respectively. Find $P(X \geq 1)$ if n = 6.

4. If X in a Poisson variate such that $2p(x = 0)+P(x = 2) = 2P(x = 1)$ Find E(x)

5. Prove that $-1 \leq r_{xy} \leq 1$ where r_{xy} in the correlation co-efficient between X and Y.

6. If the regression equation are 3x+2y=36 and 6x+y=31 Find mean values of X and Y.

7. Write down Little's formulas that hold good for the infinite capacity Poisson queue models.

8. If a customer has to wait in a (M/M/1): (∞/FIFO) queue System. What is his average waiting time in the queue is $\lambda = 8$ per hour and $\mu = 12$ per hour.

9. Find the lower and upper control limits for $\overline{X}$ chart if n = 5, $\overline{X}$ =15.

10. What re the elements of time series.

Answer All the Questions

11. (a) In a shooting test, the probability of hitting the target in ½ for A, 2/3 for B and ¾ for C. If all of them fire at the target, Find the probability that
(i) none the them hits the target.
(ii) atleast one of them hits the target.

(b) A Continuous Random variable X that can assume any Value between X=2 and X=5 has a density function given by f(x)=K(1+x)
(i) Find K
(ii) Find P(X<4)
(iii) Find P(2<X<3)

(or)

12. (a) In a bolt factory, Machines A, B and C produce 25, 35 and 40% of the total output, respectively. Of their outputs 5,4 and 2% respectively are defective bolts. If a bolt is chosen at random is found to be defective what is the probability that it was produced by B. (8)

(b) The distribution function of an Infinite Geometric distribution is given by $P(X = j) = \dfrac{1}{2^j}$ (j = 1,2,……) Find $P(X \geq 5)$ (4)

13. (a) Show that the limiting case of Binomial distribution is Poisson distribution.

(b) If X is normally distributed and the mean of X in 12 and Standard Deviation is 4.
Find out the probability of the following
(i) $X \geq 20$ (ii) $X \geq 20$ (iii) $0 \leq X \leq 12$.

(or)

14. (a) Subway trains on a certain line run every half an hour between midnight and six in the morning. What is the

Probability that a man entering the station at a random time during this period will have to wait atleast twenty minutes?

(b) The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month.
(i) Without a breakdown
(ii) With atleast one breakdown

15. (a) Find the co-efficient of correlation between X and Y from the following data. (8)

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

(b) Explain multiple regression. (4)

(or)

16. (a) Obtain the equation 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

(b) Fit a straight line to the following data (4)

X	1	2	3	4	6	8
Y	2.4	3	3.6	4	5	6

17. Given an average arrival rate of 20 per hour, is it better for a customer to get service at a single channel with mean service rate of 22 customers per hour or at one of two channels in parallel with mean service rate of 11 customers per hour for each of the two channels. Assume both queues to be of Poisson type.

18. Arrivals at a telephone booth are considered to be Poisson with an average time of 12 minute between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 4 minutes.
    (i) Find the average number of persons waiting in the system.
    (ii) Find the average number of persons waiting in the queue.
    (iii) Find the average waiting time of a customer in the system.
    (iv) Find the average waiting time of a customer in the queue.

19. (a) A textile mill produces woolean cloths and packs them in rolls. The number of defects found by inspection of 15 rolls are given as follows. Use C-chart to study the nature of control of process.

Sample No	1	2	3	4	5	6	7	8	9	10
No. of Defects	12	18	4	5	4	12	14	11	21	10
Sample No	11	12	13	14	15					
No. of Defects	9	10	13	6	9					

(b) Fit a trend line from the following data by using Semi-average method.

Year	1991	1992	1993	1994	1995	1996
Profit in Rs. (Lakhs)	10	12	14	15	13	20

(or)

20. In a pesticide factory a machine is set to deliver packets of a fixed weight. Ten samples of size 5 each were obtained by the inspector. Calculate the control limits for mean chart and range chart and comment on the nature of quality control.

Sample No	1	2	3	4	5	6	7	8	9	10
Mean $\bar{x}$	17	18	14	15	16	17	18	17	15	15
Range R	7	9	7	14	5	11	12	8	4	7