

SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.Tech - IT

Title of the paper: Probability And Statistics

Semester: V

Sub.Code: 12501 (2002/2003/2004/2005)

Date: 22-04-2008

Max. Marks: 80

Time: 3 Hours

Session: AN

PART – A

(10 x 2 = 20)

Answer All the Questions

1. If A and B are mutually exclusive events, $P(A) = 0.29$, $P(B) = 0.43$, find $P(A \cup B)$ and $P(A \cap B')$.
2. If a random variable X takes the values 1, 2, 3, 4 such that $2P(X=1)=3P(X=2)=P(X=3)=5P(X=4)$. Find the probability distribution of X .
3. If on an average, rain falls on 10 days in every 30 days, obtain the probability that the first three days of a given week will be fine and the remaining four days wet.
4. Six coins are tossed 2400 times. Find the probability of getting 4 heads 2 times.
5. If x, y denote the deviations of the variates from arithmetic means and if $r = 0.5$, $\sum xy = 120$, $\sigma_y = 8$, $\sum x^2 = 90$, find the number of items.
6. If $\text{Var}(X) = 208.69$, $\text{Var}(Y) = 283.76$, $\text{Var}(X-Y) = 137.61$, find $r(x,y)$.

7. What is an R-chart?
8. What are the control lines for C Chart?
9. For $(M / M / 1) : (\infty / \text{FIFO})$ model, write down the Little's formula.
10. For $(M / M / C) : (N / \text{FIFO})$ model, write down the formula for
 - (a) Average number of customers in the queue.
 - (b) Average waiting time in the system.

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

11. (a) A coin is biased so that a head is twice likely to occur as a tail. If the coin is tossed thrice, what is the probability of getting exactly two tails? (4)
 (b) A man draws 3 balls from an urn containing 5 white and 4 black balls. He gets Rs.10 for each white ball and Rs.5 for each black ball. Find his expectation. (8)
 (or)
12. Consider the joint density function of the random variables X and Y.

$$f(x,y) = x(1+3y^2)/4 \quad 0 < x < 2, 0 < y < 1$$
 - (i) Verify that this can be a p.d.f.
 - (ii) Find $P(0 < X < 1, \frac{1}{4} < Y < \frac{1}{2})$
 - (iii) Find the marginal distributions
 - (iv) Are X and Y independent?
13. In a certain factory making razor blades, there is a small probability of 1/500 for an blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing (i) no defective (ii) one defective and (iii) 2 or more defective blades in a consignment of 10,000 packets.

(or)

14. The slum clearance authorities in a city installed 2000 electric lamps in a newly constructed township. If the lamps have an average life of 1000 burning hours, with a standard deviation of 200 hours, assuming that the life of the lamps follows normal law.
- (i) What number of lamps might be expected to fail in the first 700 burning hours?
 - (ii) After what period of burning hours would you expect that 10 percent of the lamps would have been failed?
15. (a) The two regression lines are $4x - 5y + 33 = 0$ and $20x - 9y = 107$ and $\sigma_x^2 = 25$, find the mean of x, mean of y, correlation coefficient and variance of y. (4)
- (b) The ranking of 10 students in two subjects x and y are (8)

| | | | | | | | | | | |
|---|---|---|---|---|---|----|---|----|---|---|
| X | 3 | 5 | 8 | 4 | 7 | 10 | 2 | 1 | 6 | 9 |
| Y | 6 | 4 | 9 | 8 | 1 | 2 | 3 | 10 | 5 | 7 |

Find the rank correlation coefficient.

(or)

16. Obtain the regression lines from the following data and calculate the correlation coefficient.

| | | | | | | | | |
|---|----|----|----|----|----|----|----|----|
| X | 22 | 26 | 29 | 30 | 31 | 31 | 34 | 35 |
| Y | 20 | 20 | 21 | 29 | 27 | 24 | 27 | 31 |

17. Explain np – chart with an example.

(or)

18. Explain the various components of time series analysis.
19. A bank has two tellers working on savings account. The first teller handles withdrawals only. The second teller handles deposits only. It has been found that the service time distributions for both deposits and withdrawals are exponential with mean

service time of 3 minutes per customer. Depositors are found to arrive in a Poisson fashion throughout the day with mean arrival rate of 16 per hour. Withdrawers also arrive in a Poisson fashion with mean arrival rate of 14 per hour. What would be the effect on the average waiting time for the customers if each teller could handle both withdrawals and deposits.

(or)

20. In a heavy machine shop, the overhead crane is 75% utilized. Time study observations gave the average slinging time as 10.5 minutes with a standard deviation of 8.8 minutes. What is the average calling rate for the services of the crane and what is the average delay in getting service? If the average service time is cut to 8.0 minutes, with a standard deviation of 6.0 minutes, how much reduction will occur, on average, in the delay of getting served?

