ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : MAY / JUNE 2010

REGULATIONS : 2007

FIFTH SEMESTER

070030022 - PROBABILITY AND QUEUEING THEORY

(COMMON TO CSE / IT)

TIME : 3 Hours Max.Marks : 100

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. Write the axioms of Theory of Probability
2. What is the Probability of picking an ace and a king from a 52 cards deck?
3. If P(A) = 0.35, P(B) = 0.73, P(A∩B) =0.14. Find P (A'U B').
4. What are the two types of moments?
5. When a fair coin is tossed 200 times, determine the mean and variance.
6. Define Geometric distribution.
7. Give the applications of Uniform distribution
8. Give the mean and variance of Poisson distribution
9. List any two properties of Joint distribution
10. Define Covariance.
11. Explain positive and negative correlation
12. Give any two regression equations
13. Define non-stationary process
14. Define Homogeneous chain
15. Give any two properties of Poisson process
16. Define birth process.
17. Expand FIFO and LIFO
18. Define steady state

19. Give the formula for average number of customers in the system
20. Given λ = 10 hrs, μ = 1/3 mins. Find ρ.

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. a) Define Baye's theorem — 4

b) If two events A and B are independent, show that — 8

i) A' and B' are independent

ii) A' and B are independent

iii) A and B' are independent

22. a) Four coins are tossed simultaneously. What is the probability of getting — 6

i) 2 heads ii) at least 2 heads

b) In a normal distribution, 31 % of items are under 45 and 8 % are over 64. Find mean and variance of the distribution. — 6

23. a) Calculate correlation coefficient for the following data — 8

X	9	8	7	6	5	4	3	2	1
Y	15	16	14	13	11	12	10	8	9

b) In a trivariate distribution, it is found that r_{12} = 0.7 r_{13} = 0.61 and r_{23} = 0.4 Find the partial correlation coefficient. — 4

24. a) Given the joint pdf f(x,y) as 8

$$F(x,y) = \begin{cases} 1/4\,(1+xy), & |x| < 1 ; |y| < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find the marginal and conditional pdf of x and y.

b) When do we say random variables x and y are independent. 4

25. a) Prove that the two independent Poisson process is not a Poisson process. 6

b) What are the classifications of Markov process? 6

26. a) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter arrival time follows an exponential distribution and the service time is also exponential with an average of 36 minutes. Calculate 8

1) Mean queue size
2) the average number of trains in the queue
3) the probability that the queue size exceeds 10
4) if the input of trains increase to an average 33 per day, what will be the change in (1) and (3) ?

b) Define Balking and Reneging in queuing theory. 4

27. a) From the following data obtain two regression equations 6

X	6	2	10	4	8
Y	9	11	5	8	7

27. b) If $f(x,y) = \begin{cases} e^{-x+y}, & x \geq 0, y \geq 0 \\ 0, & \text{elsewhere} \end{cases}$ 6

Is the joint probability density function of random variable x and y. Find

1) $P(x<1)$ 2) $P(x<1 \cap y<3)$

28. a) A supermarket has two girls running up sales at the counters. If service time for each customer is exponential with mean 4 mins and if people arrive in poisson fashion at rate of 10 per hour. 8

i) What is the probability of having to wait for service?
ii) What is the expected percentage of idle time for each girl?
iii) If a customer has to wait, what is the expected length of waiting time?

b) Define queue with an example. 4

*****THE END*****