Printed Pages—4 **MEC202**

(Paper Code and Roll No. to be filled in your Answer Book)

Roll No. | | | | | | | | | | |

M. Tech.

(SEM. II) THEORY EXAMINATION 2010-11

PROBABILITY STATISTICS AND QUEUING MODEL

Time : 3 Hours *Total Marks : 100*

Note :— (1) Attempt all questions.

(2) All questions carry equal marks.

(3) Notations used have usual meanings.

(4) Assume any relevant data, if missing.

1. Attempt any four parts at the following :

(a) A box contains n identical balls numbered 1 through n, suppose k balls are drawn in succession.

(i) What is the probability that m is the largest number drawn ?

(ii) What is the probability that the largest number drawn is less than or equal to m ?

(b) A standard pack of cards has 52 cards, 13 in each of 4 suits. Suppose 4 players are dealt 13 cards each from a well shuffled pack. What is the probability of dealing a perfect hand i.e. of any one suit) ?

Bernoulli's Trials (Page 51)

(c) Show that a set with n elements has :

$$\frac{n(n-1)\cdots(n-k+1)}{1,2\cdots\cdots k} = \frac{n!}{k!(n-k)!}$$

(d) State and prove Bayes' theorem.

(e) A box contains 3 blue and 2 red marbles while another box contain 2 blue and 5 red marbles. A marble drawn at random from one of the boxes turn out to be blue. What is the probability that it came from the first box ?

(f) Find the probability that n people n ≤ selected at random will have n different birthdays.

2. Attempt any two :

(a) Define queuing systems. Describe the characteristics according to which they are classified.

(b) Discuss the (M/M/1) : (K/FIFO) – Single server with finite capacity model.

(c) 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 with an average 36 minutes. Calculate the following :

(i) The average number of trains in the queue.

(ii) The probability that the queue size exceeds 10.

3. Attempt any four :

(a) Derive the mean and variance for binomial distribution.

(b) The probability of a student passing a subject is 0.8. What is the probability that he will pass the subject before the third attempt ?

(c) Six coins are tossed 2400 times using Poisson approximation. Obtain an expression for getting four heads.

(d) What are the properties of expectation of a random variable ?

(e) Determine the steady state equations for the Birth and Death process.

(f) Define Markov Process.

4. Attempt any two :

(a) Explain M/M/r/r (Erlang's Model).

(b) State and prove Burke's theorem.

(c) A petrol pump has two pumps. The service time follows the exponential distribution with a mean of 4 minutes and cars arrive for service in a Poisson process with a rate of 10 cars per hour. Find the probability that a customer has to wait for service.

5. Attempt any **two** :

(a) Discuss Pollaczek–Khinchin (P–K) mean value formula.

(b) Write short notes on :

(i) Cyclic queues

(ii) MMSE.

(c) State and prove Nyquist theorem.