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Paper Id: **231202** **Roll No:** | | | | | | | | | | |

M-Tech
(SEM II) THEORY EXAMINATION 2017-18
Probability Statistics & Queuing Model

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x10 = 20

a. Customer arrives at a sales counter manned by a single person according to a Poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with mean of 100 seconds. Find the average waiting time of a customer.
b. Define distribution functions.
c. Define moment generating function.
d. Two cards are drawn simultaneously from the same set. Find the probability hat at least one of them will be the Ace of hearts.
e. Write the general characteristics of a poisson distribution.
f. What are memoryless systems.
g. State Little's theorem.
h. A fair coin is tossed 10000 times. What is the probability that the number of heads is between 4900 and 5100?
i. Define Random variables.
j. Define the concept of busy period in queueing theory.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. Derive the mean and variance for Binomial distribution.
b. Determine the steady state equation for the birth and death process.
c. State and prove Burke's theorem.
d. Define queuing system, describe the characteristic according which they are classified.
e. State and prove Baye's theorem.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) Derive the steady state solution for the (M/M/1):(∞/FIFO) model.

(b) On an average 96 patients per 24-hour day require the service of an emergency clinic. Also on average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average servicing time to 10 minutes, and that each minute of decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from 11/3 patients to 1/2 patient.

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4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Explain difference between random process and Markov process.

(b) State and prove Nyquist theorem.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a)Write the short note on Markov chains.

(b)Explain M/M/r/r queue Erlang's model.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a)A company distributes its products by trucks loaded at its only loading station, both, company's and contractor's trucks, are used for this purpose. It was found out that on an average every five minutes, one truck arrived and the average loading time was three minutes. 50% of the trucks belong to the contractor. Find out:

(i) the probability that a truck has to wait,

(ii) the waiting time of truck that waits, and

(iii) the expected waiting time of contractor's trucks per day, trucks per day, assuming a 24-hours shift.

(b)Write the short notes on Pollackzec-Khinchin mean value formula.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) In a certain factory turning aut razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use appropriate and suitable distribution to calculate the approximate number of packets containing no defective, one defective and two defective blades respectively in a consignment of 50000 packets.

(b) A box B_1 contains 10 white and 5 red balls and a box B_2 contains 20 white and 20 red balls. A ball is drawn from each box. What is the probability that the ball from B_1 will be white and the ball from B_2 is red?

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