

(3 Hours)

80 Marks

- N.B.: (1) Q.1 is compulsory.
 (2) Attempt any three out of remaining five.
 (3) Figures to the right indicate full marks.

- Q 1A)** Explain in detail Simulation application in any one of the following system:- [10]
 (i) Vehicle Flow analysis at a Petrol Pump
 (ii) Customer flow analysis at an Airport.
 (iii) Book Counter Analysis in a Library
- B)** Suppose that cars arriving at a toll booth follow a Poisson process with a mean inter-arrival time of 30 seconds. What is the probability that up to one minute will elapse until two cars have arrived? [05]
- C)** A recent survey indicated that 82% of single women aged 37 years old will NEVER be married in their lifetime. Using binomial distribution, find the probability that two or three women in a sample of twenty will indeed get married. [05]
- Q 2** The rail shuttle cars at Atlanta airport have a dual electrical braking system. A rail car switches to standby system automatically if the first system fails. If both systems fail, there will be a crash! Assume that life of a single electrical braking system is exponentially distributed with a mean of 3500 operating hours. If the systems are inspected every 5000 operating hours, what is the probability that a rail car will not crash before that time? [10]
- A)**
- B)** What are the characteristics of a queue? Illustrate the measures of performance of queuing system with proper notations. [10]
- Q 3A)** Draw the flowchart and explain the steps in simulation study. [10]
- B)** Explain the inverse transform method to generate random variates for exponential distribution. Use it to generate four random variates for exponential distribution with $\lambda = 3$. Use random numbers: 0.4146, 0.9950, 0.7004, 0.2123 [10]
- Q 4A)** Explain the types of simulation with respect to output analysis. [10]
- B)** The time it takes for an aircraft to land and clear the runway at a major international airport has a Weibull distribution with $v = 2.43$ minutes, $\beta = 0$ and $\alpha = 0.08$ minute. Find the probability that an incoming airplane will take more than 2.5 minutes to land and clear the runway. [10]
- Q 5A)** Explain in detail 'time series' input models. [10]
- B)** The sequence of numbers 0.31, 0.94, 0.88, 0.85, 0.66, 0.78, and 0.56 has been generated. Use the Kolmogorov-Smirnov test with $\alpha = 0.05$ and corresponding $D^\alpha = 0.486$ to learn whether the hypothesis that the numbers are uniformly distributed on the interval $[0, 1]$ can be rejected. [10]

- Q 6A)** Explain the Acceptance Rejection method for random variate generation. Use the acceptance-rejection technique to generate three Poisson variates with mean $\alpha = 0.35$. Use the following random numbers: 0.1402, 0.9473, 0.6386, 0.8726, 0.9217, 0.8868 **[10]**
- B)** Write short notes on: **[10]**
- a) Verification and Validation of Simulation Models
 - b) Goodness of fit test for input analysis
-