M.C.A - Sem - IV dt: 24.5.17 (CBGS) **Q.P. Code :01353**

**[Time: Three Hours]** **[ Marks:80]**

**Please check whether you have got the right question paper.**

**N.B:**
1. **Question.No.1 is compulsory.**
2. **Attempt any four out remaining six.**
3. **Figures to the right indicate full marks.**

Q.1 A) Explain in detail Simulation application in any one of the following system:- (10)
i) Job flow analysis at a Job Shop for Repair Jobs
ii) Customer flow analysis at an Airport.
iii) Check-out counter at Super Market.

B) Using the multiplicative congruential method to find the period of the generator for two different seed values: $X_0 = 2, 3$. The multiplier and modulus are given respectively as: $a = 13$, and $m = 2^6 = 64$. (05)

C) Accidents at an industrial site occur one at a time, independently, and completely at random, at a mean rate of one per week. What is the probability that no accidents occur in the next three weeks? (05)

Q.2 A) Simulate Able-Baker Call Center Problem (an example of dual-channel queueing system) for 5 customer arrivals so as to compute the following measures of performance: a) Average Caller delay, b) Probability that Able is Idle, and c) Probability that Baker is Idle. Here Able is assumed as more experienced than Baker and thus can provide service faster than Baker. Therefore when both are idle Able should take the call. If both are busy the call goes on hold. Here it is assumed that the first customer arrives at clock time zero. The probability distributions for inter-arrival times and Able and Baker's service times are as zero. The probability distributions for inter-arrival times and Able and Baker's service time are as under: (08)

**Table 1:** Probability Distribution for Time between Calls (ranging from 1 to 4 minutes)

| **Inter-arrival Distribution of Calls** | |
|---|---|
| **Interarrival Time (in Minutes)** | **Probability** |
| 1 | 0.35 |
| 2 | 0.25 |
| 3 | 0.20 |
| 4 | 0.20 |

**Table 2:** Probability Distribution for Able's Service Times

| **Able's Service Time Distribution** | |
|---|---|
| **Service Time (in Minutes)** | **Probability** |
| 1 | 0.35 |
| 2 | 0.30 |
| 3 | 0.25 |
| 4 | 0.10 |

**Table 3:** Probability Distribution for Baker's Service Times.

| **Baker's Service Time Distribution** | |
|---|---|
| **Service Time (in Minutes)** | **Probability** |
| 2 | 0.40 |
| 3 | 0.23 |
| 4 | 0.20 |
| 5 | 0.17 |

Use the below random number sequences for generating service times and inter-arrival times:

| | |
|---|---|
| Random Number seq for service Times | 0.70, 0.38, 0.01, 0.66, 0.51 |
| Random Number seq for inter-Arrival Times: | 0.54, 0.04, 0.44, 0.88 |

(B) Explain in brief the general characteristics of Queueing System and some of the long run measures of performance used in evaluating queueing systems through simulations. (0

Q.3 A) Use inverse transform technique to develop a random-variate generator for random variable X having exponential distribution with parameter $\lambda$. Apply the developed random-variate generator to generate five exponential variates with $\lambda = 2$, using the following random numbers: 2.29, 0.94, 0.88, 0.85, and 0.66. (08)

0.29

B) Explain and illustrate with diagram the steps to be followed to conduct a sound simulation study. (07)

Q.4 A) The sequence of random numbers 0.45, 0.37, 0.89, 0.22 and 0.86 has been generated. Use the Kolmogorov Smirnov test, with level of significance $\propto = 0.05$ and critical value: $D_\alpha = 0.565$, to learn whether the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. (08)

B) What do you mean by "Goodness of Fit"? What is the purpose of statistical methods devised to test "Goodness of Fit" in the context of simulation modeling? Illustrate the working of Chi-Square test in this context. (07)

Q.5 A) Apply acceptance-rejection technique to generate poison variate with $\propto = 0.2$ using the following sequence of five random numbers: 0.2956, 0.9462, 0.3417, 0.1916, and 0.8783. How many poisson variate were you able to successfully generate? (08)

B) Illustrate and explain the iterative process of model building, verification and validation with a suitable diagram. (07)

Q.6 A) Explain Poisson Process. Prove that if arrivals occur according to Poisson process with mean rate $\lambda$ then time between arrivals are exponentially distributed and independent with mean$1/\lambda$. (08)

B) A professor gives four problems on each exam. Each problem requires an average of 30 minutes grading time for the entire class of 15 students. The grading time for each problem is exponentially distributed, and the problems are independent of each other. (07)

(a) What is the probability that the professor will finish the grading in 1.5 hours or less?

(b) What is the expected grading time?

Q.7 A) Write short notes on: (i) Input Modelling (ii) Time Series Input Models (08)

B) Lead times have been found to be exponentially distributed with mean 3.7 days. Generate five random lead times from this distribution using random numbers: 0.35, 0.68, 0.12, 0.30, and 0.95. (07)

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# Fwd: Correction in Program Code:T8624 Subject Name:System Modeling and Simulation Q.P Code :01353

1 message

**Hemant Vasaikar** <vasaikarhb@spit.ac.in> Wed, May 24, 2017 at 3:52 PM
To: exam@spit.ac.in

pfa

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From: **University of Mumbai** <support@muapps.in>
Date: Wed, May 24, 2017 at 3:43 PM
Subject: Correction in Program Code:T8624 Subject Name:System Modeling and Simulation Q.P Code :01353
To: vasaikarhb@spit.ac.in

University of Mumbai

Correction in Program Code:T8624 Subject Name:System Modeling and Simulation Q.P Code :01353

Read As,

Q.3) A) Random Number:0.29 instead of 2.29

2 : A
7 : B
4 : B

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