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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION-APRIL-2022

B.Tech-IV Semester (CS/IT)

COURSE CODE: 18B11CI413 MAX. MARKS: 25

COURSE NAME: Modeling and Simulation Techniques

COURSE CREDITS: 03 MAX. TIME: 1 Hour 30 Min

Note: *All questions are compulsory. Marks are indicated against each question in square brackets.*

Q1. The life of a laser-ray device used to inspect cracks in aircraft wings is given by X, a continuous random variable assuming all values in the range x≥0. The pdf of the life time in years is as follows:

$$f(x) = \begin{cases} \frac{1}{2}e^{-x/2}, & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate:

a) Mean and variance of life of the device in years

b) The probability that the life of the device is between 2 and 3 years. [04]-CO-1

Q2. Differentiate between Chi-square test and Kolmorgorov-Smirnov test. [03] –CO-2

Q3. What are the characteristics of the good random number generator and how these can be achieved? [03]-CO-2

Q4. The sequence of the numbers 0.54, 0.73, 0.98, 0.11 and 0.68 has been generated. Use the Kolmorgorov-Smirnov test with $\alpha = 0.05$ to determine if the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. (Critical value is 0.565 at 5% level of significance, and degree of freedom 5) [05]-CO-2

Q5. The following table represents the past 100 months record of monthly number of job related injuries at an underground coal mine industry as studied by a federal agency: [05]- CO-2

Injuries per month	Observed Frequency of occurrence (Oi)	Expected Frequency of occurrence (Ei)
0	35	30
1	40	30
2	13	20
3	6	10
4	4	5
5	1	3
6	1	2

Apply Chi-square test to validate the Poisson distribution (Critical value is 11.1 at 5% level of significance, and degree of freedom 5)

Q6. Generate the random numbers using Linear Congruential Method for the following parameters and compare their period [05]- CO-2

(a) Seed=1, C=0, a=1 and m=32.

(b) Seed=2, C=0, a=1 and m=32.