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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech Production and Industrial — **Semester – VII**
Subject (Course): Modeling and Simulation — **Max. Marks : 100**
Course Code : IPEG 441 — **Duration : 3 Hrs**
No. of page/s:

Section-A

Attempt all Questions **5X4 = 20**

1) Define the term balking, jockeying and reneging.
2) Define discrete event simulation. Explain the various time advance mechanisms.
3) Differentiate between continuous and discrete random variable. Give the suitable example for each of them.
4) A random variable X has an exponential distribution with probability density is given by

$$f(x) = \begin{cases} 2e^{-2x} & x > 0 \\ 0 & x \leq 0 \end{cases}$$

Compute the probability that x is not less than 3. Find mean and standard deviation.

5) Differentiate between random numbers and pseudo random numbers. Generate 10 random numbers by using mid square method. Use the initial seed as 8765

Section-B

Attempt all parts (4X10 = 40)

6) In a repairing shop maximum no of customers that can be accommodate in the queue is 10. Customers are arriving at an average rate of 8 customers per hour. Average service rate is 9customer per hour. Assume ideal conditions. Find the
   i) Probability of zero customer in the system
   ii) Probability of 1 customer in the system.
   iii) Probability of no que
   iv) Probability of forced balking
   v) Length of system

7) Derive the expression for production order quantity by using production consumption model.
8) Define binomial distribution. Find out expression for mean and standard deviation of binomial distribution. A coin is tossed 6 times what is the probability of getting two heads also find the probability of getting at least two heads.
9) Differentiate between beta and Weibull distribution. Write down the expressions for pdf and cdf for both. The time to failure for a component to have a Weibull distribution with v = 0, bita = 1/3 and alfa= 200 hrs. What will be mean time to failure also find probability that the unit fails before 2000 hrs.

OR

Discuss about geometric distribution. Find the expression of mean and variance of geometric distribution.

Section-C

Attempt all parts (2X20= 40)

10) Differentiate between multiplicative and Mixed Linear congruential generators. For the following LCG, generate random numbers Zi For enough values of I greater than 1 to cover entire cycle.
a) $z_i = (11z_{i-1})(mod\ 16),\ z_0 = 1$
b) $z_i = (11z_{i-1})(mod\ 16),\ z_0 = 2$
c) $z_i = (2z_{i-1})(mod\ 13),\ z_0 = 1$
d) $z_i = (3z_{i-1})(mod\ 13),\ z_0 = 1$

OR

Enlist various methods of testing the uniformity and independence of random numbers. Explain each of them in detail. Generate the random numbers by using following LCG

$z_i = (9z_{i-1} + 3)(mod\ 16),\ z_0 = 8$

Test the uniformity of first five random numbers by using Kologmrov Smirnove test. Use the confidence level of 0.05 for the test. (Standard KS table is attached with the paper)

11) Explain about the components of discrete event simulation. Give the details of organization of discrete event simulation program.

Standard K S table is given in next page.

Appendix 3

Kolmogorov–Smirnov Tables

Critical values, $d_{alpha};(n)^{a}$, of the maximum absolute difference between sample $F_n(x)$ and population $F(x)$ cumulative distribution.

Number of trials, n	Level of significance, α			
	0.10	0.05	0.02	0.01
1	0.95000	0.97500	0.99000	0.99500
2	0.77639	0.84189	0.90000	0.92929
3	0.63604	0.70760	0.78456	0.82900
4	0.56522	0.62394	0.68887	0.73424
5	0.50945	0.56328	0.62718	0.66853
6	0.46799	0.51926	0.57741	0.61661
7	0.43607	0.48342	0.53844	0.57581
8	0.40962	0.45427	0.50654	0.54179
9	0.38746	0.43001	0.47960	0.51332
10	0.36866	0.40925	0.45662	0.48893
11	0.35242	0.39122	0.43670	0.46770
12	0.33815	0.37543	0.41918	0.44905
13	0.32549	0.36143	0.40362	0.43247
14	0.31417	0.34890	0.38970	0.41762
15	0.30397	0.33760	0.37713	0.40420
16	0.29472	0.32733	0.36571	0.39201
17	0.28627	0.31796	0.35528	0.38086
18	0.27851	0.30936	0.34569	0.37062
19	0.27136	0.30143	0.33685	0.36117
20	0.26473	0.29408	0.32866	0.35241
21	0.25858	0.28724	0.32104	0.34427
22	0.25283	0.28087	0.31394	0.33666
23	0.24746	0.27490	0.30728	0.32954
24	0.24242	0.26931	0.30104	0.32286