



M.E DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2014)

Second Semester

INDUSTRIAL ENGINEERING

P14IET202: System Modelling and Simulation

(Use of approved statistical tables permitted)

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Matching type item with multiple choice code

[K₂]

List I	List II
A. Random Number	i. Probability distribution
B. Random variates	ii. Stochastic
C. Continuous	iii. Uniformity
D. Discrete	iv. Deterministic

A B C D

- a) i iv ii iii
b) iii i iv ii
c) i ii iii iv
d) iv iii ii i

2. Important model parameters were identified by_____

[K₂]

- a) Statistical analysis b) Validation
b) Verification d) Sensitivity analysis

3. Assertion (A): random numbers are generated using random variates

[K₂]

Reason (R): random variates represents events in the system

- a) Both A and R are correct b) Both A and R are incorrect
c) R is the true definition of A d) A is wrong and R is correct

4. Weibull random variates are used to model _____

[K₂]

- a) Failure of electronic components b) Room temperature

- c) Pressure in a hydraulic circuit d) Line current
5. The use of acceptance and rejection technique to generate random variate is justified when _____ [K₂]
- a) Efficient algorithm for random variate generation is required b) CDF is sum of different distributions
- c) Cumulative distribution function (CDF) does not exist in closed form d) Data is from normal distribution
6. Degeneration means _____ [K₁]
- a) Appearance of same sequence of random numbers b) Eliminating the input variables
- c) Reducing the variables by applying assumptions d) Converting the variables from one type to another
7. System is collection of objects connected by _____ [K₁]
- a) Boolean operators b) Physical connections
- c) Logical operators d) Regular interaction and interdependence
8. Assertion (A): Time tied events are events scheduled to occur at the same time [K₂]
Reason (R): Time tied events are executed based on their priority
- a) Both A and R are correct b) Both A and R are incorrect
- c) R is the true definition of A d) A is wrong and R is correct
9. Simulation is the process of _____ [K₂]
- a) Studying the past history b) Comparing the past history data of different systems
- c) Generating artificial history d) Documenting the history
10. Sequence the following [K₂]
A) Documentation B) Validation C) Verification D) Data collection and synthesis E) Problem definition
- a) E – A – B – D – C b) E – B – A – C – D
- c) E – D – C – B – A d) E – A – D – B – C

PART B (10 x 2 = 20 Marks)

11. List the types delays used in simulation study specify with example. [K₂]
12. Compare and list any two differences between mathematical and physical model. [K₂]
13. What is the necessity to ensure uniformity in random numbers. [K₂]
14. Differentiate random numbers from random variates [K₂]

15. Discuss the objective of conducting runs test. [K₂]
16. List the requirements of good random number generator. [K₂]
17. List the variants of GENERATE block in GPSS. [K₂]
18. How to generate random variates from exponential distribution in GPSS? [K₂]
19. List the importance of documentation. [K₂]
20. Identify the random variables associated with single server queue. [K₂]

PART C (10 x 5 = 50 Marks)

21. What is system and system environment? Explain the components of a system with an example. [K₂]
22. List the various types of system and models with examples. [K₂]
23. Using multiplicative congruential method, generate random numbers to complete cycle. Explain maximum density and maximum period, multiplier = 11, modulus = 16, seed = 7 and increment = 3. [K₂]
24. Based on the frequency with which the gaps occur analyze the following observation to test whether they are independent. Use $\alpha=0.05$. The number of gaps associated with the various digits are as follows: [K₂]

Gap	Observed frequency
0 to 1	3
2 to 3	2
4 to 5	4
6 to 7	3
8 to 9	3
10 to 11	4
12 to 13	0
14 to 15	2
16 to 17	3
18 to 19	1

25. Using suitable frequency test find out whether the random numbers generated are uniformly distributed on the interval [0,1] can be rejected. Assume $\alpha=0.05$, the random numbers are 0.54,0.73,0.98,0.11,0.68. [K₃]
26. What is acceptance – rejection technique? Generate three Poisson variates with mean $\infty = 0.2$. [K₂]
27. Discuss the advantages and applications of simulation. [K₂]
28. Explain with a flow diagram the various stages involved in the execution of GPSS Program. [K₂]
29. Explain the simulation of single server queue system with queue discipline FIFO. [K₂]

30. Discuss the various aspects involved in the simulation of a manufacturing system. [K₂]

PART D (2 x 10 = 20 Marks)

31. Explain significance of different steps involved in the simulation with a neat flow chart. [K₂]

32. i) Derive the expression for generating random variates from exponential distribution (5) [K₂]
using inverse transform technique? and list the applications of exponential
distribution. (5)

ii) The time to attend a breakdown call is found to follow exponential with a mean of 2
hrs. Generate exponential random variates representing the time to attend. Use the
following random numbers: 0.1306, 0.0422, 0.6597, 0.7965 and 0.7696.
