(Subject Code and Roll No. to be filled in your Answer Book)

Roll No. 1 2 1 6 5 4 0 5 0 7

M.Tech.

(SEM. I) THEORY EXAMINATION 2012–13

SIMULATION, MODELLING AND ANALYSIS

Time : 3 Hours *Total Marks : 100*

Note :– (i) Attempt **all** questions.

(ii) All questions carry equal marks.

1. Attempt any **two** parts of the following :

(a) Suppose that a day's production schedule calls for 9000 items. Three machines A, B and C each with a daily production capacity of 4000 have the probability that an item is defective on them as 1, 2 and 4 percent respectively. On a given day 4000 items were produced on A, 4000 on B and 1000 on C. One item is selected at random and found defective. What is the probability that it was produced on A or B or C ?

(b) Explain the terms :

(i) Random variable

(ii) Mean

(iii) Variance

(iv) Correlation.

(c) How does simulation assist in studying the behavior of real life systems ? Write the limitations of simulation technologies.

2. Attempt any **two** parts of the following :

(a) In the automobile wheel suspension system, it is found that shock absorber damping force is not strictly proportional to the velocity of the wheels; there is an additional force component equal to D2 times the acceleration of the wheel, find the new conditions for ensuring that the wheel does not oscillate.

(b) Explain the Monte-Carlo technique of simulation. Can this technique be applied to static models ?

(c) Arrivals at service station have been found to follow Poisson process. The mean arrival rate is $\lambda = 6$ units per hour. Simulate 5 hours of arrivals at the station.

3. Attempt any **two** parts of the following :

(a) Explain :

(i) Full corporate model

(ii) Management segment

(b) What is system design ? Designing the problem of small part of a computer system, the computer responds to the message immediately. Draw the flow chart of it.

(c) Draw the cobweb models for the following market.

$D = 12.4 - 1.2P$

$S = 8.0 - 0.6P-1$

$P_0 = 1.0$

4. Write short notes on any **three** of the following :

(i) Closed and open system

(ii) Continuous & discrete system

(iii) Simulation software for manufacturing application

(iv) Basic principle of modeling

(v) Hybrid simulation & feed back systems.

5. Attempt any **two** parts of the following :

(a) A company establishes a pension fund for its employee by setting aside Rs P a month for each employee. The accumulated fund is invested and earns 5% per annum. The work force is expected to grow at 3% per annum. The company wants to study the soundness of its plan & propose to simulate the effects of different assumptions about average length of service and average length of retirement. Draw the dynamics flow chart for the simulation.

(b) What is continuous probability function ? Approximate the following function with 10 straight lines at equally spaced interval of x

$y = 0.5093 + 0.2 \sin x$

$0 \leq x \leq \pi/2$

Use the approximation of 10 random numbers having this distribution.

(c) Calculate the probability of there being n arrivals ($n = 0,1,.....10$) in an interval of 10 sec. When the arrivals have a Poission distribution with a mean value of 0.4.