

( 3 Hours )

[ Total Marks : 75

- N.B.
1. Attempt any Five questions but not more than THREE from any section
  2. Answers to the two sections to be written in separate answer books and should be submitted separately
  3. Figures to the right indicate full marks. Each question is of 15 marks
  4. Use random numbers provided in printed sheet only (generally horizontally)
  5. Use of nonprogrammable scientific calculator is allowed

**Section I**

Q1.

a) A large milling machine has three different bearings that fail in service. The distribution function of the life of each bearing is identical as shown in the table below. When a bearing fails, the mill stops, a repair person is called and a new bearing is installed. The delay time of the repairperson arriving at the milling machine is also a random variable with the distribution given in the table below. Downtime is estimated at Rs. 5/- minute. The direct onsite cost of the repairperson is Rs. 15/hour. It takes 20 minutes to change one bearing and 30 minutes to change two bearings and 40 minutes to change three bearings. The bearing cost Rs. 16/- each. A proposal has been made to replace all the three bearings whenever a bearing fails. Management needs an evaluation of this proposal

Bearing Life time	
Bearing Life	Probability
200	0.10
210	0.13
220	0.25
230	0.13
240	0.09
250	0.12
260	0.02
270	0.06
280	0.05
290	0.05

Delay distribution	
Delay time	probability
5	0.6
10	0.3
15	0.1

Bearing1	Random number for life	67	08	49	84	44	30	10	63	02	77
	delay	2	3	1	7	8	1	2	8	3	8
Bearing1	Random number for life	70	43	86	93	81	44	19	51	45	12
	delay	0	7	3	1	2	8	1	1	7	8
Bearing1	Random number for life	76	65	61	96	65	56	11	86	57	49
	delay	0	2	7	1	3	3	6	3	1	4

b) List at least 4 advantages and disadvantages of simulation.

OR

[ TURN OVER

Q2.

a) Demand for the widgets follow the probability distribution as shown below. The stock is examined every 7 days (the plant is operational every 7 days). And if the stock level has reached 6 units or less an order for 10 widgets is placed. The lead time(days until delivery is probabilistic and follows the following distribution. When a simulation begins it is a beginning of the week, 12 widgets are on hand and no orders pending. Simulate 3 weeks of operations of this system. Analyze the system. Also calculate average closing inventory and average demand per cycle. Also determine the effect of shortages if increase or decrease in reorder quantity.

Daily demand distribution	
demand	probability
0	0.33
1	0.25
2	0.20
3	0.12
4	0.10

Lead time distribution	
Lead time	probability
1	0.3
2	0.5
3	0.2

Random number for demand	24	35	65	81	54	03
	87	27	73	70	47	45
	48	17	09	42	87	26
	36	40	07			
Lead time	5	9	0			

b) Consider a grocery store with one checkout counter that has to be simulated. The system consists of those customers in waiting line and the one at the checking counter. With respect to this scenario give the steps in the execution of the arrival and departure events. (Consider the required statistics).

Q3.

a) Given the following sequence of the numbers below. Can the hypothesis that the numbers are independent be rejected on the basic of the length of runs above and below the mean at  $\alpha=0.05$ ? (given  $z_{0.025}=1.96$ )

0.34	0.90	0.25	0.89	0.87	0.44	0.12	0.21	0.46	0.67
0.83	0.76	0.09	0.64	0.70	0.81	0.04	0.74	0.22	0.74
0.96	0.99	0.27	0.67	0.56	0.41	0.52	0.73	0.99	0.02

b) Write a short note on history of simulation.

OR

Q4.

a) The inter-arrival times as well as service times at a single chair unisex barber shop have been shown to be exponentially distributed. The value of  $\lambda$  and  $\mu$  are 2 per hour and 3 per hour respectively. That is the time between arrival averages  $\frac{1}{2}$  hour exponentially distributed and the service time averages 20 minutes. Find the server utilization and the probability of 4 or more customers in the shop also find

- i. Time average number of customers in the system
- ii. Time average number of customer in the queue
- iii. Average time a mechanic spends at a tool crib
- iv. Average time spent waiting for a tool crib.

b) Explain the principle of generation of random variate with exponential distribution. Given  $\lambda=2$ . Generate at least 6 random variates.

0.30 0.48 0.36 0.01 0.54 0.34

Q5.

- a) Explain briefly the four stages or steps in developing input simulation. 7
- b) The life times of certain kinds of electronic device have a mean of 300 hours and a S.D of 25 hours. Assuming that the dist of these life times, which are measurable to the nearest hour can be approximated closely with normal curve. 8
  - i. Find the probability that any one of these electronic devices will have a life time more than 350 hours.
  - ii. What percentage will have lifetimes of 300 hours or less?
  - iii. What percentage will have lifetimes from 220 or 260 hrs? 7

- OR

Q6.

- a) Based on Kolmogrov Smirnov method, determine whether the following sequence of 10 numbers is such that the hypothesis of uniformity can be accepted where  $\alpha=0.05$ . Also give a procedure for the same. (Table value 0.24) 8

0.34	0.90	0.25	0.89	0.87	0.44	0.12	0.21	0.46	0.67
0.83	0.76	0.79	0.64	0.70	0.81	0.94	0.74	0.22	0.84
0.99	0.17	0.23	0.19	0.82	0.93	0.65	0.37	0.39	0.42

- b) Explain in brief the techniques used to identify the family of distribution in input analysis while simulation modeling. 7

Section - II (7)

- 7 a. Discuss various reusability issues with respect to a C++ class library. 7
- b. Does exporting C++ member functions from a DLL solve the problem to create a vendor independent component substrate? Why? 8

OR

- 8 a. Write in detail about COM HRESULT type? 7
- b. Give C++ definition of IUNKNOWN? State and explain its different methods? 8

- 9 a. What is object activation? Discuss the different activation models? 7
- b. What is a Query-Interface? Explain its different properties in detail? 8

OR

- 10 a. Explain with an example Objects have static types? 7
- b. Write a note on: a) Single Threaded Apartment and Multithreaded Apartment. b) Cross apartment access. 8

- 11 a. What is JNI? Write a native Method for Reverse number and show its implementation? 7
- b. Explain the relationship among the EJB server, container and bean. 8

OR

- 12 a. What is the relationship between CORBA, OMA, and OMG? 7
- b. Explain the concept of Object Interfaces and Apartment? 8