TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Chaitra

Exam.	**Regular**		
Level	BE	**Full Marks**	80
Programme	BCT	**Pass Marks**	32
Year / Part	IV / II	**Time**	3 hrs.

Subject: - Simulation and Modeling *(CT 753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define simulation. Explain the various steps in simulation study with diagram. [2+6]
2. Explain Static Mathematical model and dynamic mathematical model with example. [8]
3. Define feedback system. Design and explain the analog computer model of the liver with necessary block diagram and equations. [2+6]
4. Define and explain Queuing system. Explain Kendall Notation using D/M/1/FIFO/8/50. [5+3]
5. Explain Markov-Chain process with its features. Given that chance of a Hyundai Creta car user to buy Hyundai Creta car at next purchase is 70% and that his next purchase will be Tata Nexon EV car is 30%. The chance of Tata Nexon EV car user to buy Tata Nexon EV car at next purchase is 80% and that his next purchase will be Hyundai Creta car is 20%. What is the probability to buy Tata Nexon EV car after three purchase of a current Hyundai Creta car user? Also make necessary transition diagram of above problem. [5+3]
6. State the various test for random numbers and explain briefly any one of uniformity test method. [4+6]
7. A sequence of 1000 four-digit numbers has been generated and an analysis indicates: Based on Poker test, test these numbers are independent for $\alpha = 0.05$. (Use 9.49 as Tabular Value) [8]

Combinations (i)	Observed Frequency (Oi)
FourDifferent Digits	540
One Pair	320
Two Pair	70
Three like Digits	50
Four like Digits	20

8. Explain Naylor and Finger's approach used in validation. [5]
9. Explain the replication of runs with example. [5]
10. What do you mean by simulation software ? Explain at least three GPSS diagram with one example. [2+4]
11. What is the different level of abstraction for the simulation of computer systems? [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Chaitra

Exam.	**Regular**		
Level	BE	**Full Marks**	80
Programme	BCT	**Pass Marks**	32
Year / Part	IV / II	**Time**	3 hrs.

Subject: - Simulation and Modeling *(CT 753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Differentiate between Simulation and Modeling. Draw the flowchart representing phases in simulation study and explain the model building phase. [2+6]
2. Differentiate between static mathematical model and dynamic mathematical model with necessary mathematical equation and a practical example of each model. [6]
3. Define analog method. Explain with the example of Automobile suspension problem. Discuss the advantages of analog computer over digital computer. [2+5+3]
4. Explain the characteristics of queuing system. What is the meaning of M/D/6/10/FIFO in queuing system? A barber with a one-man shop takes exactly 30 minutes to complete one haircut. If customers arrive according to a Poisson process at a rate of one every 40 minutes, how long on the average must a customer wait for service? [4+2+4]
5. Explain Markov chain with example. Given that a chance of Tesla car user to buy a Tesla car in next purchase is 60% and that his next purchase will be a BMW is 40% and chance of BMW car user to buy BMW car at the next purchase is 85% and chance that his next purchase will be Tesla car is 15%.
   a) Make transition diagram of above problem and construct a transition matrix.
   b) What is the probability to buy a BMW car after three purchase of a current Tesla car user? [3+5]
6. Write an algorithm of Kolmogorov-Smirnov test. Perform Kolmogorov-Smirnov test for the following random numbers with level of significance of $\alpha = 0.05$. Random numbers are: 0.45, 0.16, 0.29, 0.98, 0.45, 0.13, 0.63, 0.75, 0.11, 0.38. (The critical value for $\alpha = 0.05$ is 0.410 for sample size N = 10) [8]
7. Use mixed congruential method to generate a sequence of six random numbers with $X_0 = 27$, $a = 17$, $m = 100$ and $c = 43$. Explain Poker test steps for three digit numbers. [3+5]
8. Explain Naylor and finger validation approach. [5]
9. Explain the method for elimination of initial bias with example. [5]
10. Explain Simulation in GPSS with example. [6]
11. Explain CPU simulation with example. [6]

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(31)

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Chaitra

Exam.	**Regular**		
Level	BE	**Full Marks**	80
Programme	BCT	**Pass Marks**	32
Year / Part	IV / II	**Time**	3 hrs.

Subject: - Simulation and Modeling *(CT 753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain with various steps of simulation study. List advantages of simulation study. [6+2]
2. Explain dynamic physical model with practical example. [6]
3. Why differential equations are important in simulation and modeling? What is analog computer? Explain the analog method for automobile suspension problem with necessary equations and figure. [2+2+6]
4. Discuss the elements of queuing systems and its applications. Define the meaning of D/M/1/LIFO/20/80. [8+2]
5. Given that a chance of a Honda user to buy a Honda in next purchase is 60% and that his next purchase will be Yamaha or Bajaj is 30% and 10% respectively. Also if a chance of a Yamaha user to buy a Yamaha in next purchase is 70% and that his next purchase will be Bajaj or Honda is 10% and 20% respectively and a chance of a Bajaj user to buy Bajaj in next purchase is 65% and that his next purchase will be Honda or Yamaha is 20% and 15% respectively.
   a) Design the Markov Model for the given Scenario. [3]
   b) What is the probability to buy Honda after two purchases for a current Yamaha user? [3]
6. What do you mean by uniformity test? Explain the process of uniformity test of random numbers by K-S method, using your own example. [2+8]
7. A sequence of 1000 four digit numbers where generated as follows: [8]

Combination	Observed Frequency
All different digits	540
One pair	320
Two pair	70
Three of a kind	50
All same digits	20

   Use poker test to check independence. (Use tabulated value as 9.488 for confidence of 95% and N = 4).
8. Comparison between verification and Validation with example. [5]
9. What are the various methods used to analyze simulation output? Explain any one of them. [5]
10. Explain at least 4 GPSS block diagram symbols. [6]
11. What are the different levels of abstraction for simulation in computer system? [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2077 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT 753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the advantages of simulation? Explain briefly the steps in simulation study. List the areas of application of simulation. [2+4+2]
2. Explain Static Mathematical Model with a practical example. [8]
3. Why do we need digital-analog simulator? Explain the analog model at automobile suspension problem with equation and diagram. [4+4]
4. Discuss about characteristics and applications of queuing system. What do you mean by D/M/6/FIFO/25/3000 in queuing notation? [5+3]
5. Explain markov chain process, its features and applications with example. [8]
6. A sequence of 1000 four-digit numbers has been generated and an analysis indicates the following combinations and frequencies: [8]

Combination (i)	Observed Frequency (Oi)
4 different digits	540
3 like digits	50
4 like digits	20
1 pair	320
2 pairs	70

Use Poker's test to determine if these random numbers are independent at $\alpha = 0.05$. Given critical value of χ^2 at $\alpha = 0.05$ and degree of freedom = 4 is 9.49.

7. Write the algorithm of Kolmogorov-Smirnov test. Use the Kolmogorov-Smirnov test for the following random numbers with level of significance of $\alpha = 0.05$ is 0.432 for sample size N = 9. Random numbers are: 0.37, 0.55, 0.71, 0.97, 0.65, 0.29, 0.84, 0.78, 0.23 [4+6]
8. Explain iterative process of calibrating a model. Why is it done? [5]
9. Explain replications of runs in simulation output analysis. [5]
10. What is GPSS? Explain four general blocks used in GPSS with an example. [6]
11. Explain different levels of abstraction for the simulation of computer system. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT 753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define system, model and simulation. Explain when is simulation considered an appropriate tool and when not? [4+4]
2. Differentiate between Dynamic physical and mathematical model with reference to simulation of automobile wheel suspension. [8]
3. Define analog computers. Explain analog methods using the model of a liver with necessary diagram. [3+7]
4. What are the elements of a Queuing System? What are the characteristics of Queuing System? What is the meaning of M/Em/2/9/70/SIRO in a queuing system. [3+3+4]
5. What are the three key features of Markov Chain? Given that a chance of a MoMo lover to order MoMo in next purchase is 70% and that his next purchase will be Burgar is 30% and chance of a Burgar lover to order a Burgar at the next purchase is 80% and chance that his next purchase will be MoMo is 20%.
   a) What is the probability to buy a Burgar after three purchase of a current MoMo lover?
   b) If 55% of people order MoMo today and 45% people order Burgar, what percentage of poeple will use MoMo after 3 puchase? [2+3+3]
6. The generated random numbers are 0.206, 0.389, 0.915, 0.287, 0.443, 0.767, 0.109, 0.177, 0.999, 0.0156. Use Kolmogorov-Smimov test to check whether the numbers are uniformly distributed or not at a confidence level of 95%. (Note the critical value of D for α=0.05 and N=10 is 0.410) [6]
7. A sequence of 10,000 four-digit numbers has been generated and an analysis indicates the following combinations and frequencies: Use Poker's test to determine if these random numbers are independent, α=0.05 and degree of freedom = 4 is 7.78. [8]

Combination Distribution (i)	Observed Frequency (O_i)
4 different digits	5000
3 like digits	700
4 like digits	500
1 Pair	3000
2 Pairs	800

8. Differentiate between verification and validation of a model with suitable example. [5]
9. Differentiate between estimation method and Replication of runs. [6]
10. Imagine a machine tool in a manufacturing shop is turning out parts at the rate of one in every 5 minutes. As they are finished the parts go to an inspector and in the inspector takes 4±3 minutes to examine each one and rejects about 10% of parts. Develop the GPSS block diagram for above scenario using necessary GPSS blocks. [5]
11. Explain different levels of abstraction for the simulation of computer system. [6]

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33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain the steps of Simulation study. [8]
2. Explain Static mathematical model and dynamic mathematical model with example. [6]
3. What is analog method? Explain with the example of Automobile suspension problem. [2+8]
4. What are the characteristics of Queuing system? What do you mean by Kendall notation in queuing system? What is the meaning of M/D/8/15/1000/LIFO? [4+3+3]
5. Given that a chance of a Ford car user to buy a ford car in next purchase is 70% and that his next purchase will be a Scorpio car is 30% and chance of a Scorpio car user to buy a Scorpio car at the next purchase is 80% and chance that his next purchase will be ford car is 20%. What is the probability to buy a Scorpio car after three purchase of a current Ford car user? If 70% user uses Ford car today, what percentage of user will use Scorpio after 3 purchases? [6]
6. Why do we use gap test? A sequence of 1000 four-digit numbers has been generated and an analysis indicates the following combinations and frequencies: Use Poker's test to determine if these random numbers are independent, $\alpha = 0.05$ and $n = 4$ such that $\alpha_{(0.05,4)} = 9.49$. [2+8]

Combination Distribution (i)	Observed Frequency
4 different digits	540
3 like digits	50
4 like digits	20
2 Pairs	70
1 Pair	320

7. What are different random number generation methods. Explain with examples. [8]
8. Explain with example the iterative process of calibrating of model. [5]
9. How can you use estimation methods in analysis of simulation output? Explain with example. [5]
10. Briefly explain about simulation in Java. [6]
11. Explain CPU simulation with example. [6]

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44 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is simulation? Explain the steps of Simulation Study with flowchart. [2+6]
2. Differentiate between static mathematical model and dynamic mathematical model with suitable examples. [6]
3. Write down the significance of differential equations. Explain the analog computer model of liver with necessary equation and diagrams. [4+6]
4. Define queuing system with block diagram and its uses. Explain M/M/4/20/2000/FCFS and D|M|2|LIFO|18 system. [6+2+2]
5. Given that change of a Sony user to buy Sony at next purchase is 80% and that his next purchase will be Samsung is 20% and chance of a Samsung user to buy Samsung at next purchase is 85% and chance that his next purchase will be Sony is 15%. What is the probability to buy Sony after three purchase of a current Samsung user? If 60% user uses Sony today, what percentage of user uses Samsung after three purchase? [4+2]
6. What are the properties of random number? Explain the techniques of generation of random number with appropriate example. [2+6]
7. What are the properties of Random number? Using Chi-Square test the uniformity at 90% for the given random numbers. Degree of freedom for 6 = 10.645, 7 = 12.017, 8 = 13.362 9 = 14.684, 10 = 15.987. [3+6]

20	34	43	42	14	10	33	17	6	11
15	16	4	1	35	22	9	46	37	57
51	49	40	27	59	5	44	19	41	55
53	29	3	31	48	8	56	28	12	7

8. Explain about the Calibration and Validation of Models. [5]
9. Explain the structure of Java Simulation with example. [6]
10. How you can analyze simulation output using simulation runs statistics? Explain [6]
11. Explain CPU simulation with example. [6]

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44 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Magh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain with steps of simulations study. List advantages of simulation study. [6+2]
2. Explain dynamic physical model with necessary equations and diagrams. [6]
3. What is analog method? Design and explain analog computer model of liver with example. [2+8]
4. Explain the queuing notation with at least two examples and also explain about possibility of default values for notation. Explain about different elements of Queue System. [5+5]
5. Design markov model and transition matrix for given data. Answer following questions based on the model. [2×3]
   a. If a person purchase coke now the probability of purchase of coke next time is 80%.
   b. If a person purchase pepsi now the probability of purchasing pepsi next time is 70%.

   Problems:
   i. Find the probability of using coke for a current pepsi user in 4^{th} purchases.
   ii. Find the probability for a person using pepsi now for a current pepsi purchaser after 4 purchases.
   iii. A population of 5250 (Out of 10200) in a study of soft drink user uses coke now, find the population of purchasing pepsi in 4^{th} purchases.
6. Explain the different congruential random number generation methods with example. Explain rejection method. [5+3]
7. Write an algorithm for Gap Test. A sequence of 10,000 five digit numbers has been generated and analysis indicates the following combinations and frequencies. Based on Poker Test check whether the number are independent. Use $\chi^2 0.056,6 = 12.592$ [4+6]

Combinations	Observed Frequencies
All Different	3044
One pair	5020
Two pair	1090
Three of a kind	700
Full house	95
Four of a kind	40
Five of a kind	11
Total	**10,000**

8. Comparisions between verification, validation and calibration of a model using example. [5]
9. Why do we need Replications of Runs, explain with example. [5]
10. Explain at least 5 CPSS block diagram symbols. [6]
11. Discuss memory simulation with example. [6]

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44 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT 753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain the different components of system with example. Write down the advantages and disadvantages of Simulation. [4+4]
2. Differentiate between Static mathematical model and dynamic mathematical model with suitable examples. [6]
3. Why differential equations are important in scientific and engineering studies? Explain the analog method for Automobile Suspension Problem with necessary equations and figure. [4+6]
4. What is a queuing system? List the various characteristics of queuing system. Explain role of queuing system in simulation study. Explain Kendall notation with example. [2+2+2+4]
5. Define Markov chain. List the key feature and application of Markov chain. [2+4]
6. What are different random number generation methods? Explain with examples. [8]
7. What are the properties of Random numbers? Explain the algorithm of Kolmogorov-Smirnov Test with example. [4+6]
8. Explain Naylor and Finger validation approach. [5]
9. Explain the simulation Run statistics with example. [5]
10. Explain the single server queuing simulation model using JAVA. [6]
11. Explain about simulation of a central processing unit for the lower level of abstraction. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT 753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define system, model and simulation. And clarify with suitable example. List various advantage and disadvantage of simulation? [3+1+4]
2. Explain dynamic physical model with example. [6]
3. Design and explain analog method of automobile suspension problem? Explain feedback system with suitable example? [6+4]
4. What is queuing model, explain with figure? What is the meaning of M/D/2/60/150/FIFO in queuing notation? Explain the Kendall notation with example. [3+2+5]
5. Write down the application of Markov chains? Given that chance of a Sony user to buy Sony at next purchase is 75% and that his next purchase will be Samsung is 25% and chance of a Samsung user to buy Samsung at next purchase is 85% and chance that his next purchase will be Sony is 15%. What is the probability to buy Sony user after three purchase of a current Samsung user? [2+4]
6. A sequence of 1000 four digit number has been generated and an analysis indicates the following combination and frequencies: [8]

Combination (i)	Observed Frequency (Oi)
Four different digit	520
One pair	390
Two pair	55
Three like digit	34
Four like digit	1
	1000

7. What do you mean by pseudo random numbers? Explain Gap test algorithm with example. [2+8]
8. Explain the iterative process of calibrating a model with example. [5]
9. How can you use estimation method in analysis of simulation output? Explain with example. [5]
10. Explain the overall structure of Java Simulation of a Single Server Queue. [6]
11. Explain the simulation model of computer system that services request from www. [6]

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44 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Ashwin

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is Simulation and Modeling? Explain when simulation is appropriate and not appropriate tool. [2+6]
2. Explain static mathematical model with suitable example. [6]
3. What is analog computer; explain with its pros and cons. Explain the analog computer model for liver with necessary figures. [4+6]
4. What are the characteristics of queuing system? Discuss any one practical application of queuing system. [5+5]
5. What are the key features of Markov chain? Given that chance of a Honda Bike user to buy Honda Bike at next purchase is 70% and that his next purchase will be Yamaha Bike is 30% and change of a Yamaha Bike user to buy Yamaha Bike at next purchase is 80% and change that his next purchase will be Honda Bike is 20%. What is the probability to buy Yamaha Bike after three purchase of a current Honda Bike user? [2+4]
6. What are the properties of random numbers? Explain the steps of Gap test algorithm with example. [4+6]
7. A sequence of 10,000 five digital numbers has been generated and analysis indicates the following combinations and frequencies. [8]

Combinations (i)	Observed Frequency (O_i)
All different	3450
One pair	4510
Two pair	1150
Three of a kind	750
Full house	85
Four of a kind	40
Five of a kind	15
Total	10,000

Based on Poker Test Check whether the number are independent. Use $\alpha = 0.05$ and $N = 6$ is 12.592

8. What is calibration and validation of models? Explain with practical example. [5]
9. Define initial Bias. Explain the methods for the elimination of initial bias. [5]
10. Explain in brief the simulation in JAVA with example. [6]
11. Explain the different level of abstraction for the simulation of computer system. [6]

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44 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. What is simulation? Describe general steps in simulation study. [8]
2. Explain dynamic mathematical model with example. [6]
3. What is continuous system simulation? Explain analog computer with practical example. [4+6]
4. What are the characteristics of queuing system? What is the meaning of D/M/1/LIFO/20/510 in queuing system? Write down the application of queue? [5+3+2]
5. What is Markov chain? Find the transition probability of a Pepsi user who will buy Coke on third purchase. Transition probability is as below: [6]

	Pepsi	Coke
Pepsi	0.7	0.3
Coke	0.1	0.9

6. What assumptions should we made while generating pseudo-random numbers? Write an algorithm for Gap Test with example. [4+6]
7. A sequence of 1000 four digit numbers has been generated and an analysis indicates the following conditions. Based on poker test, are these numbers independent? (use α=0.05 and N = 4 is 9.488) [8]

Combination Distributions	Observed Frequency
4 different Digits	510
3 Like Digits	40
4 Link Digits	5
1 Pair	410
2 Pair	35

8. Explain steps in model building, verification and validation with diagrams. [5]
9. How it can be eliminated in simulation output analysis? [5]
10. Explain the different features that are relevant when selecting simulation software. [6]
11. Explain simulation of CPU with example. [6]

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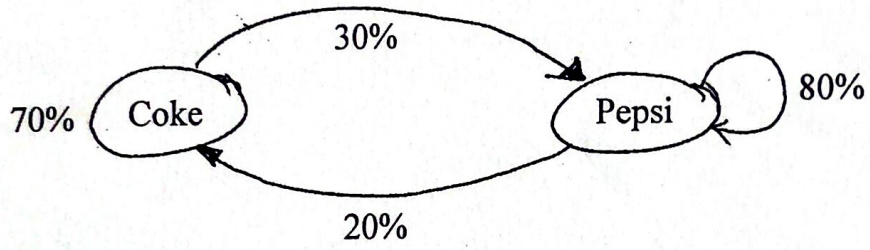
44 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modelling *(CT753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is simulation and modelling? Explain the steps in simulation study. [2+6]
2. Explain the dynamic physical model with example. [6]
3. What is analog method? Explain with example of automobile suspension problem. [4+6]
4. What is the model of queuing system? What do you mean by the Kendall's notation in queuing systems? What is the meaning of M/D/8/15/LIFO in queuing system? Explain. [5+2.5+2.5]
5. Given figure shows Coke and Pepsi purchaser [6]



   a) If currently Coke purchaser, what is the probability of Pepsi purchaser in 3rd purchase?
   b) If 55% of people use Coke today, what percentage of people will use Coke after 3 purchases?
6. Write an algorithm for gap test. Formulate 4-digit poker test with suitable data with example. [4+6]
7. Define pseudo random numbers. The following numbers have been generated 0.44, 0.19, 0.88, 0.27, 0.55, 0.13, 0.63, 0.74, 0.11 and 0.33. Use the Kolmogorov-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. (Note that the critical value of D for α 0.05 and N = 10 is 0.410. [2+6]
8. Explain the iterative process of calibrating a model with example. [5]
9. How can you use estimation methods in an analysis of simulation output? Explain with example. [5]
10. Explain with example of simulation in JAVA with single server queue model. [6]
11. Explain with CPU simulation by sketching a simulation model of computer system. [6]

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44 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(CT753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary chart is attached herewith.***
- ✓ *Scientific calculator is allowed.*
- ✓ *Assume suitable data if necessary.*

1. Define modeling and simulation. Explain steps involved in simulation study. [2+6]
2. What is dynamic mathematical model? Explain with examples. [6]
3. a) Explain significance of differential equation in the context of continuous system simulation. [3]
   b) Develop an analog computer model of the liver and explain it. [7]
4. Mention the characteristics of queuing system. Explain the Kendall's notation in queuing systems. What is the meaning of M/D/6/10/FIFO in queuing system? [2.5+5+2.5]
5. Explain Markov Chain with an appropriate example. [6]
6. a) What is a random number? What are the problems associated with generating pseudo random numbers. [8]
   b) A set of 10,000 4-digit random values have been generated. An observation shows than 5065 values have all different digits, 2000 have 2 of a kind digits, 760 have 3 of a kind, 1500 have 2 pairs and 675 have all same digits. Test these values for randomness using Poker test (Use $\alpha = 0.05$). [7]
7. Explain Naylor and Finger's steps used in validation in brief. [5]
8. What is initial bias? What is the approach for elimination of initial bias? [5]
9. Explain the at least 5 GPSS block diagram symbols with example. [6]
10. Write short notes on: (any three) [3×3]
    a) Calibration of a model
    b) Application of queuing system
    c) Convolution in random number
    d) CPU simulation

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Examination Control Division

2070 Magh	Programme	BCT	Pass Marks 32
	Year / Part	IV / II	Time 3 hrs.

Subject: - Simulation and Modeling *(CT753)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Necessary chart is attached herewith.*
- ✓ *Scientific calculator is allowed.*
- ✓ *Assume suitable data if necessary.*

1. What is simulation? Explain with various steps of simulation process. [8]
2. Differentiate between physical and Mathematical Models with proper examples. [6]
3. What are the major difference between analog computer and analog methods? Design an analog computer model of the liver and explain it. [4+6]
4. What is a queueing system? List the basic characteristics of a queueing system. Explain role of Queueing systems in simulation study. Explain kendall notation with example. [2+2+2+4]
5. Explain Markov Chains? Given that chance of a Nokia user to buy Nokia at next purchase is 80% and that his next purchase will be Samsung is 20% and chance of a Samsung user to buy Samsung at next purchase is 85% and chance that his next purchase will be Nokia is 15%. What is the probability to buy Samsung after two purchase of a current Nokia user? [6]
6. a) Define random variables. Explain properties of Random variables. [2+3]
   b) A set of 100 random numbers have been generated as below: [6]

0.23	0.30	0.07	0.39	0.43	0.47	0.66	0.19	0.49	0.37	0.53
0.80	0.56	0.10	0.28	1.00	0.23	0.04	0.93	0.25	0.90	0.24
0.88	0.75	0.54	0.84	0.42	0.68	0.12	0.68	0.16	0.72	0.93
0.14	0.71	0.23	0.76	0.96	0.89	0.82	0.99	0.42	0.22	0.77
0.36	0.95	0.35	0.14	0.89	0.26	0.99	0.78	0.23	0.75	0.67
0.34	0.04	0.95	0.41	0.89	0.64	0.88	0.92	0.62	0.84	0.36
0.88	0.32	0.86	0.24	0.42	0.54	0.35	0.60	0.88	0.84	0.15
0.86	0.99	0.63	0.56	0.16	0.53	0.86	0.69	0.74	0.70	0.38
0.48	0.67	0.54	0.97	0.50	0.09	0.20	0.72	0.27	0.72	0.96

   Test these values for uniform distribution using Chi Square Test (Use α=0.05)

   c) A sequence of 1000 four digit numbers has been generated and analysis indicates the following combinations and frequencies: [7]

Combination (i)	Observed Frequency (O_i)
Four different digits	540
One pair	380
Two pairs	54
Three like digits	25
Four like digits	1
	1000

   Based on poker test check whether the numbers are independent. Use α=0.05 and $x^2 = 9.49$

7. Explain the iterative process of calibration of model with example. [5]
8. Explain role of elimination of initial bias in analysis of simulation output. [5]
9. Explain GPSS model for a general scenario of a manufacturing shop with conditional transfer. [6]
10. Explain with high level computer simulations, by sketching a simulation model of computer system that services request from the World Wide Web (WWW) [6]

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INSTITUTE OF ENGINEERING

Examination Control Division

2069 Bhadra

Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Simulation and Modeling *(EG778CT)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. Explain the static mathematical models and dynamic mathematical models with example. What are the main differences between them? (10)

2. What is queuing system? How it is useful for simulation? Explain the different types of queuing system with example. (2+2+6)

3. Explain Markov chains with example and its applications. (10)

4. Explain the digital analog simulator. Design the analog computer model of the liver and explain it. (4+8)

5. What are the two statistical properties of Random number? Explain the gap test algorithm with example. (2+8)

6. A sequence of 1000 four digit numbers has been generated and analysis indicates the following combinations with frequencies:

Combination (i)	Observed Frequency(O_i)
Four different digits	570
One pair	380
Two pairs	34
Three like digits	15
Four like digits	1
	1000

Based on poker test check whether the numbers are independent. Use α=0.10 and N=4 is 7.78 (8)

7. Write different types of simulation output analysis. In the case of infinite population which output analysis method is applicable. Why? Explain. (4+6)

8. Define the succession of events. Design a telephone system simulation model using GPSS symbols and explain in brief. (2+8)