

Roll No.

Total No. of Pages : 02

Total No. of Questions : 08

PHD (Civil)  
**MODELLING AND SIMULATION**

Subject Code : PHDCE-17002

Time : 3 Hrs.

Max. Marks : 100

**INSTRUCTIONS TO CANDIDATES :**

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

- Q1. On an average, 96 patients per 24 hours a day require the service of an emergency clinic. Also on an average, a patient require 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient to treat to obtain an average treating time 10 minute and that each minute decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from  $\frac{4}{3}$  patients to  $\frac{1}{2}$  patient?
- Q2. a) What is Queuing problem? What are the basic characteristics of queuing system?  
b) In what area of management can Queuing Theory can be applied successfully? Give examples.
- Q3. In a car manufacturing plant, a loading crane takes exactly 10 minutes to load a car into a wagon and again comes back to the position to load another car. If the arrival of cars is a Poisson stream at an average rate is one after every 25 minutes, calculate the average time of a car in a station.
- Q4. What is simulation? What are the applications of simulation models? Discuss the phases of simulation. Discuss briefly the types of simulation models.
- Q5. What is a random number? What are the properties of random number? Discuss Arithmetic congruential random generation with the help of example.
- Q6. Comment on when the data size is not sufficient to formulate a mathematical model as a decision making tool, we have to resort to simulation. Does it really help? Discuss.

Q7. A service station has a single service facility. The cars arrive and get services in the following manner with associated probabilities of arrival and servicing given as below –

Arrivals (minutes)	Probability	Service time (minutes)	Probability
5	0.20	10	0.05
10	0.30	20	0.35
15	0.15	30	0.20
20	0.05	40	0.10
25	0.04	50	0.25
30	0.26	60	0.05

If the service station opens at 9am and cars are serviced on first-cum-first-served, draw a simulated model for the service facility and calculate the customer satisfaction level. Do you suggest addition of another service point for the demand?

Q8. What is a system design? Discuss and compare the several system designs.