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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 61469

M.E./M.Tech DEGREE EXAMINATION, MAY/JUNE 2014.

First Semester

Computer Science and Engineering

MA 9219/MA 9329/UMA 9128/MA 904 — OPERATIONS RESEARCH

(Common to M.Tech. – Chemical Engineering, M.Tech. – Information Technology, M.E. – Software Engineering, M.E. – Network Engineering, M.E. Computer Networking and Engineering)

(Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Give the symbolic representation of queueing model.

2. What do you mean by explosive state in queueing model?

3. State Burke's theorem.

4. When a node is called a bottle neck of a queueing system?

5. Define simulation.

6. Give any two limitations of simulation.

7. Define slack variable.

8. When we say a transportation problem is unbalanced?

9. Write the mathematical formulation of non-linear programming problem.

10. Define quadratic programming.

PART B — (5 × 16 = 80 marks)

11. (a) At a railway station, only one train is handled at a time. The railway yard is only sufficient for 2 trains to wait, while the other is given signal to leave the station. Trains arrive at the stations at an average rate of 6 per hr and the railway station can handle them on an average of 6 per hr. Assuming Poisson arrival and exponential service distribution. Find the average waiting time of new train coming into the yard. If the handing rate is doubled, how will the above results get modified? (16)

Or

(b) A car servicing station has 2 bays where service can be offered simultaneously. Because of space limitation only 4 cars are accepted for servicing. The arrival pattern is Poisson with 12 cars per day. The service time in both the bays is exponentially distributed with $\mu = 8$ cars per day per bay. Find the average number of cars in the service station, the average number of cars waiting for the service and average time car spends in the system. (16)

12. (a) State and prove P-K formula for (M/G/1) queues. (16)

Or

(b) In a textile shop there are three sections one for gents section, one for ladies section and one for kids wear section. Customers arrive from outside at these sections at Poisson rates 3, 5, 6 respectively. The service times at the 3 sections are exponential with the parameters 40,60, 50 respectively. A customer completing the service at gents section is likely go to the ladies section with a probability 0.5 and to kids wear section with probability 0.3 otherwise leave the shop. A customer from the ladies section is equally likely to go to gents and the kids wear section. A customer from kids section will go to the gents section with probability 0.2 and to the ladies section with probability 0.6 otherwise leave from shop.

(i) What is the average number of customers in shop?

(ii) What is the average time a customer spends in the shop? (16)

13. (a) A sample of 100 arrivals of a customer at a retail sale depot is according to the following list. (16)

Time between arrivals (min) :	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Freq :	2	6	10	25	20	14	10	7	4	2

Service time (min) :	0.5	1.0	1.5	2.0	2.5	3.0
Freq :	12	21	36	19	7	5

Estimate the average percentage waiting time of the customers and average percentage of idle time of the server by the simulation for next 10 weeks. Use the following Random numbers. (16)

Random number for inter arrival : 82 95 18 96 20 84 56 11 52 03

Random number for service time : 51 40 34 38 72 11 76 18 33 81

Or

(b) The occurrence of the rain in a city is depending upon whether or not it rained on the previous day. If it rained on previous day the rain distribution is,

Event :	no rain	1 cm rain	2 cm rain	3 cm rain	4 cm rain	5 cm rain
Prob.	0.5	0.25	0.15	0.05	0.03	0.02

If it did not rain on the previous day, the rain distribution is

Event :	No rain	1 cm	2 cm	3 cm
Prob :	0.75	0.15	0.06	0.04

Simulate the cities whether for 10 days and determined by simulation, the total days without rain as well as the total rain for during the period. Use the following random no's 67, 63, 39, 55, 29, 78, 70, 06, 78, 76 for simulation. Assume that for the first day of simulation it has not rained the day before. (16)

14. (a) Use simplex method to solve LPP (16)

Max $z = 4x_1 + 10x_2$ subject to

$2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$

$x_1, x_2 \geq 0.$

Or

(b) Solve the following transportation problem (16)

							Supply
	9	12	9	6	9	10	5
	7	3	7	7	5	5	6
	6	5	9	11	3	11	2
	6	8	11	2	2	10	9
Demand	4	4	6	2	4	2	22

15. (a) Solve the following NLPP : (16)

Max $z = 2e^{3x_1+1} + e^{2x_2+3}$

Subject to

$x_1 + x_2 = 5$

$x_1, x_2 \geq 0.$

Or

(b) Solve the following NLPP : (16)

Max $z = 10x_1 + 4x_2 - 2x_1^2 - x_2^2$

Subject to

$2x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0.$