PC-1741/M

M-32/2051

OPERATIONAL RESEARCH-MM711/AMC420

(Semester–IV)

Time : Three Hours] [Maximum Marks : 70

Note : Attempt two questions each from Section A and B, Section C will be compulsory. Each question in sections A and B will be of 10 marks and section C will be of 30 marks.

SECTION–A

I. Show that if the arrivals are completely random, then the probability distribution of number of arrivals in a fixed time-intervals follows a Poisson distribution.

II. (a) Discuss the properties of Poisson process of arrivals.

(b) Customers arrive at a sales counter manned by a single person according to a Poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer.

III. Obtain the steady state difference equations for the queueing model (M|M||) : (N|FCFS) in usual notations and solve them for P_0 and P_1. Also, find the mean queue length for this system.

IV. (a) Obtain the steady-state solution for the number of units in the system for the queueing model.

$(M|E_k||) : (1|FCFS)$

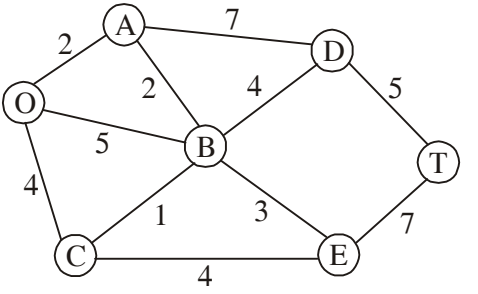
(b) In a car manufacturing plant, a loading crane takes exactly 10 minutes to load a car into a wagon and again comes back to the position to load another car. If the arrival of car is a Poisson stream at an average rate of one after every 20 minutes, calculate the average time of a car in a stationary state.

SECTION–B

V. (a) A pipeline is due for repairs. It will cost Rs. 10,000 and lasts for three years. Alternatively, a new pipeline can be laid down at a cost of Rs. 30,000 and lasts for 10 years. Assuming cost of capital to be 10% and ignoring salvage value, which alternative should be chosen.

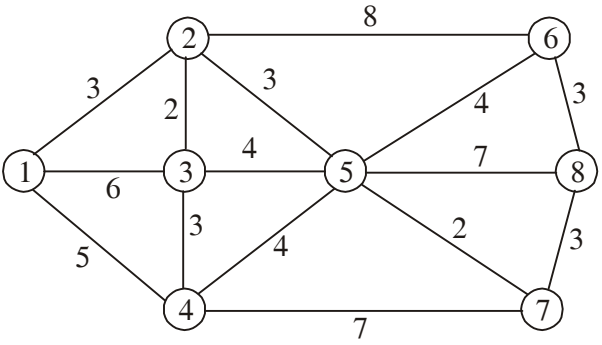
(b) Explain briefly what do you mean by individual and group replacement policy.

VI. (a) Consider the following net work where the numbers on links represent actual distance between the corresponding nodes. Find the animal spanning tree



(b) What is the shortest path problem ? Give some applications of the shortest path problem.

VII. Use Floyd's Algorithm to determine the distance (in miles) between different stations is shown on each link. Determine the shortest rout from station 1 to station 8 for the following network.



VIII. (a) Differentiate between PERT and CPM. Why might a person wish to be involved with a critical path activity ?

(b) The following table gives the activities in a construction project and other relevant information.

Activity (*i-j*)	Preceding activity	Normal time (days)	Crash time (days)	Normal Cost (Rs.)	Crash Cost (Rs.)
(1 – 2)	–	20	17	600	720
(1 – 3)	–	25	25	200	200
(2 – 3)	(1 – 2)	10	8	300	440
(2 – 4)	(1 – 2)	12	6	400	700
(3 – 4)	(1 – 3), (2 – 3)	5	2	300	420
(4 – 5)	(2 – 4), (3 – 4)	10	5	300	600

(i) Draw the activity network of the project.

(ii) Find the total float and free float for each activity.

SECTION–C
(Compulsory Question)

IX. (a) With respect to the queue system explain the following :

(i) Queue discipline.

(ii) Capacity of the system.

(b) What do you understand by traffic intensity.

(c) Give an example of real life for the queueing model :

(i) First-come, first served.

(ii) Random pick service.

(d) What is queueing problem.

(e) Define transient state of queueing system.

(f) What is replacement problem.

(g) Distinguish between breakdown maintenance and preventive maintenance.

(h) Explain when does a chain become cycle.

(i) State maximum flow problem.

(j) Define direct cost and crash cost.
