L-4/2050

OPERATION RESEARCH-MM-711/AMC-420
(Semester–IV)
(Common for Math/AMC)

Time : Two Hours] [Maximum Marks : 70

**Note** : Attempt any *four* questions. All questions carry equal marks.

I.   (a)   Explain briefly the main characteristics of queueing system.

     (b)   State the assumptions under which an arrival process is a Poisson process.

II. (a)   Explain the role of exponential distribution and its characteristics.

     (b)   People arrive at a theater ticket booth in a Poisson distributed arrival rate of 25 per hour. Service time is constant at 2 minutes. Calculate (i) The mean number in the waiting line (ii) the mean waiting time (iii) the per cent of time an arrival can walk right in without having to wait.

III. Derive differential difference equations for a generalized birth death queueing model. Obtain steady state distribution of the system size.

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) Prove that for the Erlog distribution with parameters μ and K, the model is at $(1 - 1/K)(1/\mu)$, the mean is $1/\mu$ and the variance is μ^2/K.

V. (a) Describe the problem of replacement of items whose maintenance costs increase with time. You may assume that the money value also changes with time.

(b) A computer has a large number of electronic tubes. They are subject to mortality as given below :

Period	1	2	3	4	5
Age of failure (hours)	0-200	201-400	401-600	601-800	801-1000
Probability of failures	0.10	0.26	0.35	0.22	0.07

If the tubes replaced the cost of replacement is Rs. 15 per tube. Group replacement of individual tubes which fail in service cost Rs. 60 per tube. How frequently should the tubes be replaced.
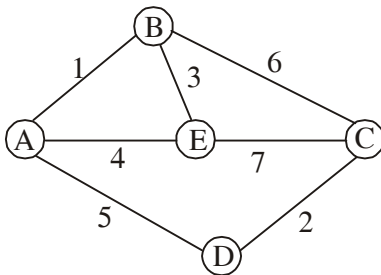
VI. (a) Find the minimal spanning free of the graph G(U, V) shows in the below fig.
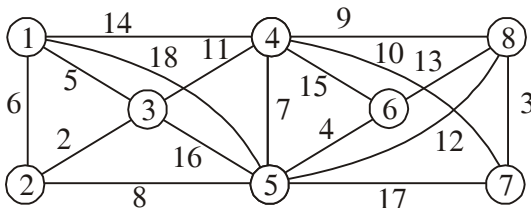
(b) Find the minimum path from v_0 to v_8 in the graph in which the number along a directed arc denotes its length.
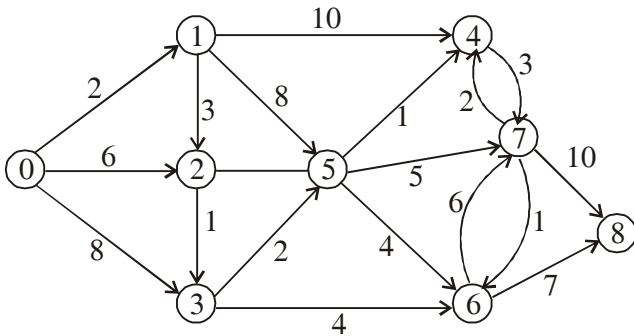
VII. Use Dijkstra's algorithm to determine a shortest path from A to C for the following networks

VIII. (a) Explain the term PERT and CPM. Bright out the special features of CPM and compare them with those of PERT.

(b) What is meant by project indirect and project direct costs ? Explain their importance.

IX. (a) With respect to the queue system explain (i) input process (ii) Holding time.

(b) What do you understand by Queue length.

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

(i) Last come, first served.

(ii) Customers stay only if served instantly.

(d) Define transient and steady states of queueing system.

(e) Define $(M \mid M \mid I)$ system.

(f) What is group replacement ?

(g) What is discount rate ?

(h) Define a chain in a graph.

(i) What is meant by a spanning tree ?

(j) Define critical path.

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