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WINTER 2020-21

CAT1

MEE1024 Operation Research A1+TA1

1. (a) Bring out the significance of the following terms with suitable examples.

i) Inventory carrying cost

ii) Shortage cost

(5 marks)

(b) A company has to supply its customers 100 units of a certain product every Monday (and only then). The company obtains the product from a local supplier at Rs.60 per unit. The costs of ordering and transportation from the supplier are Rs.150 per order. The cost of carrying inventory is estimated at 15% per year of the cost of the product carried.

i) Find the lot size which will minimize the cost of the system.

ii) Determine the optimal cost

(5 marks)

2. (a) A Xerox shop has a help desk to assist students working on computer spreadsheet assignments. The students patiently form a single line in front of the desk to wait for help. Students are served based on a first-come, first-served priority rule. On average, 15 students per hour arrive at the help desk. Student arrivals are best described using a Poisson distribution. The help desk services can help an average of 20 students per hour, with the service rate being described by an exponential distribution. Calculate the following operating characteristics of the service system. Determine,

i) The average utilization of the help desk server

ii) The average number of students in the system

iii) The average number of students waiting in line

iv) The average time a student spends in the system

(5 marks)

(b) In a supermarket, the average arrival rate of customers is 6 per hour. The average time it takes to list and calculate the customer's purchases at the cash desk is 4.5 minutes, and this time is exponentially distributed.

i) How long will the customer expect to wait for service?

ii) What is the probability that the cashier is working?

(5 marks)

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3. An oil & refinery plant is offered an equipment which is priced at Rs.60,000 and the costs of operation and maintenance are estimated to be Rs.10,000 for each of the first 5 years, increasing every year by Rs. 3000 per year in the sixth and subsequent years. If money carries the rate of interest of 10% per annum what would the optimal replacement period?