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SB-3533

M. Sc. (Part-II) Examination

March / April – 2011

5003 : Operation Research

Time : **3** Hours] [Total Marks : **42**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M. Sc. (Part-2)**

Name of the Subject :

☛ **5003 : Operation Research**

☛ Subject Code No. : **3 5 3 3** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Notations used are standard.

(3) Each question carry almost **equal** marks.

(4) All question are **compulsory**.

1 (a) For a certain manufacturing situation, the production is instantaneous and demand is r units. Show that the optimal order quantity $Q = \sqrt{\left(\frac{2c_3 r}{c_1}\right)\left(\frac{k}{k-r}\right)\left(\frac{c_1+c_2}{c_2}\right)}$ **6**

where,

c_1 = storage cost per unit

c_2 = shortage cost per unit

c_3 = set-up cost per run

k = production rate $(k > r)$.

(b) The cost of parameters and other factors for a production inventory system of automobile pistons are given below : **3**

Demand per year = 18000 units,
set-up cost = Rs. 500
Production rate per year = 36000 units
Holding cost per year = Rs. 8
Shortage cost per year = Rs. 20
Obtain the optimal lot size.

OR

1 (a) Derive an expression for economic lot size for optimum production quantity Q per cycle for a single product so as to minimize the total average cost per unit time, when **6**

(i) c_1 is the inventory storage cost per unit

(ii) c_3 is the set-up cost per run

(iii) lead time is zero

(iv) r is the units per time uniform demand rate.

(b) A manufacturer has to supply his customer with 600 units of his product per year. Shortages are not allowed and storage amounts to 60 paise per unit per year. The set-up cost per run is Rs. 80. Compute : **3**

(i) the economic order quantity

(ii) the minimum average yearly cost.

2 (a) Write the different characteristics of a queueing system. **4**

(b) State the axioms of a poisson process. Show that the probability of arrival of n units into the system follows poisson distribution. **5**

OR

2 (a) Derive the steady state probability for M/M/1 : N/FIFO queueing system. Also obtain the expressions for **6**

(i) average number of units in the system,

(ii) average queue length.

(b) At a railway station, only one train is handled at a time. The railway yard is sufficient to accomodate two trains (to wait) while the other is given signal to leave the station. Trains arrive at the station at an average rate of 6 per hour and the railway station can handle them on an average of 12 per hour. Assuming Poisson arrivals and exponential service distribution, find the steady state probabilities for various number of trains in the system. Also find average waiting time of a new train coming into yard. **3**

3 (a) Define a transportation problem. Describe three different methods for finding an initial basic feasible solution for a given transportation problem. **4**

(b) Obtain the optimum solution for a given transportation problem : 4

TO

		1	2	3	*Availability*
	1	8	5	6	120
From	2	15	10	12	80
	3	3	9	10	80
		150	80	50	

OR

3 (a) What is a replacement problem? Discuss the replacement problem where items are such that maintenance costs increase with time and the value of money also changes with time. 4

(b) A firm is considering replacement of a machine, whose cost price is Rs. 12,200 and the scrap value is Rs. 200. The maintenance costs in Rs. are found from experience are as : 4

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

when should the machine be replaced ?

4 (a) Write the PERT algorithm to solve the given network problem. 4

(b) A small project is composed of the following activities : 4

Activity	Estimated time (weeks)		
	Optimistic	Most likely	Pessimistic
1–2	1	1	7
1–3	1	4	7
1–4	2	2	8
2–5	1	1	1
3–5	2	5	14
4–6	2	5	8
5–6	3	6	15

(i) Draw the network and find critical path

(ii) Find the probability to complete the project in 21 weeks.

OR

4 (a) Write a detailed note on inventory models with in price breaks. 4

(b) Solve the following traveling salesman problem. 4

	To				
From	1	2	3	4	5
1	∞	2	5	7	1
2	6	∞	3	8	2
3	8	7	∞	4	7
4	12	4	6	∞	5
5	1	3	2	8	∞

5 (a) Define the following terms in relation to PERT/CPM : 4

(i) Pessimistic time

(ii) Event

(iii) Dummy activity

(iv) Crashing an activity

(b) Obtain the optimum sequence for the following sequencing problem : 4

Job	1	2	3	4	5
Machine M_1	12	14	10	17	18
Machine M_2	5	4	6	3	7
Machine M_3	7	8	6	9	5
Machine M_4	16	9	14	10	12

Also find the total elapsed time.

OR

5 (a) Define a sequencing problem. Write the algorithm for solving a sequencing problem with n jobs and 3 machines. 4

(b) Obtain the optimum sequence for the following sequencing problem : 4

Job	1	2	3	4
Machine M_1	15	12	16	17
Machine M_2	5	2	3	3
Machine M_3	4	10	5	4
Machine M_4	15	12	16	17

Also find the total elapsed time.