This question paper contains **4+1** printed pages]

Your Role Number.....

4143

M. Com. : Semester-II (OC) **G**

Paper No. 6203

QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS

Timp : 3 *Hours* Maximum Marks : 100

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any *five* questions.

All questions carry equal marks.

1. A firm is engaged in producing two products : P1 and P2. The relevant data are given here :

	P1	**P2**
SP/unit	Rs. 200	Rs. 240
Direct Material	Rs. 45	Rs. 50
Direct wages :	8 hrs @ Rs. 2/hr	10 hrs @ Rs. 2/hr
Deptt A	10 hrs @ Rs. 2.25/hr	6 hrs @ Rs. 2.25/hr
Deptt B	4 hrs @ Rs. 2.5/hr	12 hrs @ Rs. 2.5/hr
Deptt C		
Variable overheads	Rs. 6.50	Rs. 11.50

- Fixed overheads Rs. 2,85,000 per annum
- No. of employees in A, B and C departments are 20, 15, 18 respectively

P.T.O.

- No. of hrs/employee/week = 40 in each department
- No. of weeks per annum = 50

(*i*) Formulate it as LPP

(*ii*) Solve graphically

(*iii*) Determine product mix

(*iv*) Determine amount of profit and contribution per year

(*v*) Do you observe any redundant constraint ? If yes, which one ? 20

2. A manufacturing company makes three products, each of which requires three operations as part of the manufacturing process, the company can sell all of the products it can manufacture but its production capability is limited by the capacity of its operation centres.

Additional data concerning the company are as follows :

Product	**Manufacturing requirement (hrs/unit)**				
	Centre 1	**Centre** 2	**Centre** 3	**Cost** (Rs.)	**Selling price** (Rs.)
A	1	3	2	11	15
B	3	4	1	12	20
C	2	2	2	10	16
Hours available	160	120	80		

(*i*) What is the optimal product mix ? What is the maximum profit ?

(*ii*) What are the shadow prices of the resources ? Which resource has highest marginal value ?

(*iii*) Over what range in each of RHS values, are these shadow prices valid ?

(*iv*) Ranges over which the objective function coefficients can vary for each of the decision variables ?

(*v*) State the dual to this problem and write its solution. 20

3. Stronghold Construction Company is interested in taking loans from banks for some of its projects, P, Q, R, S, T. The rates of interest and the lending capacity differs from bank to bank. All these projects are to be completed. The relevant details are provided in the following table. Assuming the role of a consultant advice this company as to how this should take the loans so that the total interest payable will be the least. Are there any alternate optimum solutions ? If so, indicated one such solution ? 20

Bank	**Interest Rate in Percentage for Project**					**Maximum Credit**
	P	Q	R	S	T	(in thousands)
Private Bank	20	18	18	17	17	Any Amount
Nationalized	16	16	16	15	16	400
Cooperative Bank	15	15	15	13	14	250
Amount Required (in thousands)	200	150	200	125	75	

4.

Activity	**Immediately Preceding Activity**	**Normal Time (Days)**	**Normal Cost (Rs.)**	**Crash Time (Days)**	**Crash Cost (Rs.)**
A	—	3	140	2	210
B	—	6	215	5	275
C	—	2	160	1	240
D	A	4	130	3	180
E	A	2	170	1	250
F	A	7	165	4	205
G	B, D	4	210	3	290
H	C, E	3	110	2	160

P.T.O.

(*i*) Draw a PERT network.

(*ii*) Find out the critical path and the expected project completion date.

(*iii*) What is the minimum possible project completion time after crashing the activities and the associated cost of completing the project ? 20

5. A dispatcher of the police department has received four requests for police assistance. Currently, six patrol cars are available for assignment and the estimated response time (in minutes) are shown in the following table :

	Patrol unit					
Incident	1	2	3	4	5	6
I	6	5	3	4	5	6
II	8	6	2	3	7	6
III	4	4	7	6	5	5
IV	3	7	9	8	4	7

(*i*) Which patrol units should respond ?

(*ii*) What will be the average response time ? 20

6. A manufacturer of baby dolls makes two types of dolls. One is sold under the brand name Marie and the other Suzie. Processing of these two dolls is done on two machines A and B. The processing time for each Marie is 3 and 4 hours on machine A and B respectively, and that of Suzie is 1 and 4 hours on machines A and B respectively. 50 hours of machine A are available and 90 hours of machine B are available per week. The porfit contribution for a Marie is Rs. 6 and that for Suzie is Rs. 18. Formulate and solve this problem to determine the optimal weekly production schedule of the two dolls. (Provided an all-integer solution). 20

7. (*a*) Explain the basics of selective inventory control and state different selection techniques adopted in Inventory Control System. Give a brief note on each. 10

(*b*) A furniture dealer sells special typist chair. Each purchase order cost Rs. 50 and the holding costs amount to Rs. 80 per chair per year. The dealer sells 90 chairs per month. He had estimated a back-ordering cost of Rs. 20 per chair per year.

(*i*) What is the EOQ ?

(*ii*) When the supply of chair comes, how many chairs on an average are expected to be delivered to the customers immediately ?

(*iii*) What is the total annual cost of ordering, holding and back-ordering. 10

8. (*a*) What is a queuing problem ? What are the basic characteristics of queuing system ? 8

(*b*) Arrivals at the enquiry counter of a transport company are Poisson distributed with an average of 6 per hour. The time that the customers spend in seeking information from the clerk stationed at the counter is known to be exponentially distributed with an average of three minutes. Using this information determine :

(*i*) The probability that a customer reaching the counter shall have to wait for getting the needed information.

(*ii*) The probability that a queue shall be formed.

(*iii*) The expected time that a customer shall wait in the queue to obtain information.

Suppose that the company manager employs another clerk if he is convinced that the customer has to wait for at least 4 minutes for receiving information. What arrival rate would justify employing the second clerk ? 12