

M.B.A.- II CBCS Pattern Semester-III  
**PCB3C01 - Applied Operations Research**

P. Pages : 3  
 Time : Three Hours



**GUG/W/23/10690**  
 Max. Marks : 70

- Notes :
1. Attempts **any five** questions.
  2. All questions carry equal marks.
  3. Use NSD Table.

1. Determine the optimal strategies for each firm and value of Game for the following Payoff Matrix. **14**

		Firm B			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
Firm A	A <sub>1</sub>	35	35	25	5
	A <sub>2</sub>	30	20	15	0
	A <sub>3</sub>	40	50	0	10
	A <sub>4</sub>	55	60	10	15

2. A small project consisting of eight activities has the following characteristics. **14**

Activity	Dependency	Weeks		
		t <sub>o</sub>	t <sub>m</sub>	t <sub>p</sub>
A	---	2	4	12
B	---	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B, C	9	9	9
G	D	3	3.5	7
H	E, F, G	5	5	5

- i) Draw PERT Network & Determine critical path & Expected project length.
- ii) If 30 week deadline is imposed, what is the probability that the project will be finished within the time limit.

Given  $Z(0.41)$  to  $\psi(Z)(0.6591)$

3. The following is a table showing details of project **14**

Activity	Dependency	Normal		Crash	
		Time Weeks	Cost ₹	Time Weeks	Cost ₹
A	---	9	12,000	6	18,000
B	A	14	14,000	4	24,000
C	A	4	2,000	3	2,400
D	C	6	44,000	4	56,000
E	---	14	16,000	13	1,800
F	E	6	4,000	6	4,000
G	B, D	5	4,000	3	4,800
H	F, G	2	12,000	1	14,000

- i) Draw the Network & Identify the critical path.
- ii) What are the normal project duration & the associated cost.
- iii) Calculate optimum cost & its duration also find minimum time & associated cost.  
Indirect cost ₹ 2,000 / Week.

4. A manufacturer is offered two machines A and B A is priced at ₹ 5,000 and running cost are estimated at ₹ 800 for each of the first five years, increasing by 200₹ per year in the 6<sup>th</sup> & subsequent years . Machine B, which has the same capacity as A, cost ₹ 2500 but will have running cost of ₹ 1200 per year for six year increasing by ₹ 200 per year there after. If money is worth 10% per year, which machine should be purchased? (Assume that scrap value should be negligible price). **14**

5. The management of a large hotel is considering the periodic replacement of light bulbs fitted in its rooms. There are 500 rooms in the hotel and each room has 6 bulbs. The management is now following the policy of replacing the bulbs as they fail at a total cost of ₹ 3 per bulb. The management feels that this cost can be reduced to ₹ 1 by adopting the periodic replacement method. On the basis of the information given below, evaluate the alternative and make a recommendation to the management. **14**

Months of use:	1	2	3	4	5
% of bulbs failing:	10	25	50	80	100

6. A publisher proposes to publish five different books, the manuscripts of which have already been submitted to him for publication. He wants to bring all the books out in the market in as short a period as can be allowed. Each book has to be processed through the following. The time taken by each of the process as follows (in hours) **14**

Book:	1	2	3	4	5
Composing:	40	90	80	60	50
Printing:	50	60	20	30	40
Binding:	80	100	60	70	110

Determine the optimal sequence of giving the manuscript to the press & idle time for each manuscript.

7. A process involves the production of a particular component which is then installed into an end product. Past observation has indicated that the average production time for the component is 4 minutes but fluctuations about the average do occur and the following probability distribution as follows: **14**

Arrivals: (min)	2	3	4	5	6	7
Probability:	0.10	0.25	0.40	0.10	0.10	0.05

The average time taken to install a component is 3 minutes but this also fluctuates the following distribution.

Installation: (min)	2	3	4	5
Probability:	0.30	0.45	0.15	0.10

The current system uses one operative for installation but the company is considering employing another operative on the installation process.

Simulate 10 arrivals on the current system, Random No: 20, 74, 94, 22, 93, 45, 44, 16, 04, 32; 03, 62, 61, 89, 01, 27, 49, 50, 90, 98

Calculate average Idle Time & Queue Time for given process.

8. Explain with suitable examples the Monte Carlo Method for solving the theoretical problems. **14**
9. Discuss dynamic programming application to business and develop the recursive relation used in dynamic programming formulation. **14**
10. Write short note on **any two**. **14**
- a) Dynamic programming method for solving the LPP.
  - b) The simulation process.
  - c) Role of 'Theory of games' for scientific decision making.
  - d) Importance of sequencing problem.

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