

**CDOE**  
**BACHELOR OF COMPUTER APPLICATIONS (CBCS-2018 COURSE)**  
**B.C.A. Sem-IV : WINTER :- 2021**  
**SUBJECT: OPERATIONS RESEARCH**

**Day : Friday**  
**Date 18-02-2022**

**W-19009-2021**

**Time : 10:00 AM-01:00 PM**  
**Max. Marks: 70**

**N.B.:**

- 1) Attempt **ANY FOUR** questions from Section – I and **ANY TWO** questions from Section – II.
- 2) Answers to both the sections should be written in **SAME** answer book.
- 3) Figures to the right indicate **FULL** marks.

**SECTION – I**

**Q.1** Explain the concept, scope and tools of operation research as applicable to business and industry. [10]

**Q.2** Solve the following linear programming problem by graphical method: [10]  
Maximize :  $Z = 200x + 500y$   
Subject to the constraints  
 $x + 2y \geq 10$   
 $3x + 4y \leq 24$   
 $x \geq 0, y \geq 0$

**Q.3** A department of a company has five employees with five jobs to be performed. The time (in hours) that each man takes to perform each job is given in the effectiveness matrix. [10]

		Employees				
		I	II	III	IV	V
Jobs	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the job be allocated, one per employee, so as to minimize the total man-hours?

**Q.4** Write an algorithm for optimal solution of transportation problem. [10]

**Q.5** An assembly is to be made from two parts X and Y. Both parts must be turned on a lathe and Y must be polished whereas X need not be polished. The sequence of activities together with their predecessors is given below: [10]

Activity	A	B	C	D	E	F	G	H
Predecessor Activity	--	A	A	B	B, C	E	D, F	G

Draw a network diagram of activities for the project.

**Q.6** Write short notes on **ANY TWO** of the following: [10]

- a) Decision making under uncertainty
- b) Models of operations research
- c) Applications of transportation problem

**P.T.O.**

SECTION – II

- Q.7

Solve LPP by simplex method

Maximize :  $Z = 30x_1 + 40x_2$

Subject to constraints

$2x_1 + 3x_2 \leq 8$

$2x_2 + 5x_3 \leq 10$

$3x_1 + 2x_2 + 4x_3 \leq 15$

$x_1, x_2, x_3 \geq 0$

[15]

- Q.8

The Oil India Corporation (OIC) is considering whether to go for an offshore oil drilling contract to be awarded in Bombay High. If OIC bid, value would be ₹ 600 million with a 65 percent chance of gaining the contract. The OIC may set up a new drilling operation or move already existing operation, which has proved successful, to a new site. The probability of success and expected returns are as follows:

[15]

Outcome	New Drilling Operation		Existing Operation	
	Probability	Expected Revenue (₹ million)	Probability	Expected Revenue (₹ million)
Success	0.75	800	0.85	700
Failure	0.25	200	0.15	350

If the Corporation do not bid or lose the contact, they can use ₹ 600 million to modernize their operation. This would result in a return of either 5 percent or 8 percent on the sum invested with probabilities 0.45 and 0.55. (Assume that all costs and revenue have been discounted to present value.)

- a) Construct a decision tree for the problem showing clearly the courses of action.
- b) By applying an appropriate decision criterion recommend whether or not the Oil India Corporation should bid the contract

- Q.9

An insurance company has decided to modernize and refit one of its branch offices. Some of the existing office equipments will be disposed of but the remaining will be returned to the branch of completion of the renovation work. Tenders are invited from a number of selected contractors. The contractors will be responsible for all the activities in connection with the renovation work excepting the prior removal of the old equipment and its subsequent replacement. The major elements of the project have been identified as follows along with their durations and immediately preceding elements.

[15]

Activity	Description	Duration (Weeks)	Immediate predecessors
A	Design new premises	14	--
B	Obtain tenders from the contractors	4	A
C	Select the contractor	2	B
D	Arrange details with selected contractor	1	C
E	Decide which equipment is to be used	2	A
F	Arrange storage of equipment	3	E
G	Arrange disposal of other equipment	2	E
H	Order new equipment	4	E
I	Take delivery of new equipment	3	H, L
J	Renovations take place	12	K
K	Remove old equipment for storage or disposal	4	D, F, G
L	Cleaning after the contractor has finished	2	J
M	Return old equipment for storage	2	H, L

- a) Draw the network diagram showing the interrelations between the various activities of the project.
- b) Calculate the minimum time that the renovation can take from the design stage.
- c) Find the effect on the overall duration of the project if the estimates or tenders can be obtained in two weeks from the contractors by reducing their numbers.

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