Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐ **Total No. of Pages : 03**

Total No. of Questions : 07

B.Com.(P) (2011 & Onward)   (Sem.–3)
# OPERATION RESEARCH
Subject Code : BCOP-304
Paper ID : [B1127]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**

SECTION-A

1. **Write short notes on :**

    a) Define Operation Research.

    b) How does PERT differ from CPM?

    c) Write the dual of the following L.P. Problem :

    Maximize Z $= 50x_1 + 120x_2$

    Subject to $\quad 2x_1 + 4x_2 \leq 80$

    $\quad\quad\quad\quad 3x_1 + x_2 \leq 60$

    $\quad\quad\quad\quad x_1, x_2 \geq 0$

    d) What is unbalanced assignment problem?

    e) Calculate EOQ

    Annual Demand   : 2000 units

    Unit Cost   = Re.1   : Carrying Cost = 16%

    Ordering Cost = Re.10

    f) Solve the game.

	A	B	C
I	0	20	–60
II	30	–10	–20
III	70	–80	–30

g) Find IBFS by NWCM

	W1	**W2**	**W3**	**Capacity**
P1	5	6	7	140
P2	10	2	4	260
P3	5	2	5	360
Requirement	180	280	250	

h) What are the types of Inventory?

i) There are seven jobs to be processed through a single machine. The operation time in minutes is given below

Jobs	**Operations time in minutes**
x	12
y	10
z	9
P	7
Q	4
R	2
S	1

Find out optimal sequence only.

j) What is degeneracy in transportation problem?

SECTION-B

2) Solve the following LPP by simplex method :

Minimize Z $= x_1 - 3x_2 + 2x_3$

Subject to $= 3x_1 - x_2 + 2x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

Where $x_1, x_2, x_3 \geq 0$

3) The time estimates (in weeks) for the activities of a PERT network are given below :

Activity	t_o	t_m	t_p
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

   a) Draw the project network and identify all the paths.

   b) Critical Path method.

   c) Calculate the standard deviation and variance of the project.

4) a) Solve the following game by Sub game Method.

<table>
<tr><td></td><td></td><td colspan="2">B</td></tr>
<tr><td></td><td></td><td>I</td><td>II</td></tr>
<tr><td rowspan="4">A</td><td>I</td><td>2</td><td>4</td></tr>
<tr><td>II</td><td>2</td><td>3</td></tr>
<tr><td>III</td><td>3</td><td>2</td></tr>
<tr><td>IV</td><td>−1</td><td>6</td></tr>
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   b) Solve the following assignment problem to minimise the cost :

	A	B	C	D
1	15	11	13	15
2	17	12	12	13
3	14	15	10	14
4	16	13	11	17

5) Discuss briefly the importance of operations research in decision making.

6) Define Inventory. Discuss the role and importance of inventory models for management.

7) Given below is a table. Solve it as a transportation problem and test its optimality.

	1	2	3	4	Capacity
A	10	8	7	12	500
B	12	13	6	10	500
C	8	10	12	14	900
Demand	700	550	450	300	