Roll No…….. **Total No. of Printed Pages: 02**
Total No. of Questions: [09]

B.Com (Aviation, Logistics and Supply Chain Management) (Semester – 3rd)
OPERATION RESEARCH
Subject Code: BCOMS4304
Paper ID: [23140416]

Time: 03 Hours **Maximum Marks: 60**

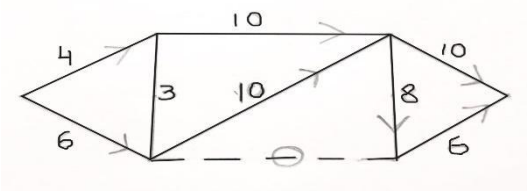
Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1 Attempt the following:

a. Write a note on types of inventory models with an example.
b. Define float. Explain its different types and then importance.
c. For the network shown in figure given below the schedule completion time is 32 days. Determine the slack time for events.



d. Write a short note on CPM and PERT.
e. Explain the limitation of Operation Research.
f. Maximize $Z = -2x_1 - x_2$ sub. To
$2x_1 + x_2 \geq 3$
$4x_1 + 3x_2 \geq 6$
$X_1 + 2x_2 \geq 3$
$X_1, x_2 \geq 0$
Solve by Graphical Method
g. Use Vogel's Approximation Method to obtain initial Basic feasible solution of the transportation Problem.

	D	E	F	G	Availabl e
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
	200	225	275	250	

h. Solve the following 3x3 Game

	Player B		
Player A	7	1	7
	9	-1	1

	5	7	6

i. Define Saddle Point.

Section – B **(5 marks each)**

Q2 A manufacturing company purchases 9000 parts of a machine for its annual requirements, ordering one month uses at a time. Each part costs Rs. 20. The ordering costs per order is Rs. 15 and carrying charges are 15% of the average inventory per year. Suggest a more economic purchasing policy for company. What advice would you offer and how much would it save company per year.

Q3 Considered the following data of a project

Activity	A	B	C	D	E	F	G	H
Predecessors	-	-	A	B	A	C, D	C, D, E	F
Optimistic Time	3	6	4	3	4	5	3	1
Most likely time	5	7	5	5	6	8	6	2
Pessimistic time	7	8	12	7	8	11	9	9

a) Find the expected duration and variance of each activity.
b) Draw the Pert network for the above project.
c) Determine the early and late start and finish times for all activities.
d) Find the critical path and the expected project completion time.

Q4 Solve the Transportation Problem using MODI method

Origin	D_1	D_2	D_3	D_4	Availability
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
Requirement	20	40	30	10	

Q5 Define following terms
i) Basic Variable
ii) Basic Solution
iii) Basic Feasible Solution
iv) Degenerate Basic Solution
v) Objective Function

Q6 Discuss various classification Schemes of Models in OR.

Section – C **(10 marks each)**

Q7 What is Linear Programming? Explain by taking an example. What are the limitation? Discuss.

Q8 Solve the following Travelling Salesman's Problem so as to Minimize the cost per cycle

To→ From↓	A	B	C	D	E
A	-----	3	6	2	3
B	3	---	5	2	3

C	6	5	---	6	4
D	2	2	6	---	6
E	3	3	4	6	---

$X_2 + 4X_3 + X_4 \leq 3$

$X_1, X_2, X_3, X_4 \geq 0$

Q9 Using Simplex Method to solve the LPP

Max $Z = 2X_1 + 4X_2 + X_3 + X_4$

$X_1 + 3X_2 + X_4 \leq 4$

$2X_1 + X_2 \leq 3$