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MAR-010-001510

Seat No. _____

B. B. A. (Sem. V) (CBCS) Examination

October / November – 2016

Operation Research - 01

[New Course]

Faculty Code : 010

Subject Code : 001510

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (i) Attempt all the five questions.

(ii) Each question carries equal marks.

(iii) Figures on the right indicate marks.

1 (a) Describe Hungarian method for solving an assignment problem. **6**

(b) Five different machines can do any of the five required jobs, with different profits resulting from each assignment as shown below : **8**

Machines

Job	*A*	*B*	*C*	*D*	*E*
1	12	18	20	8	20
2	20	4	8	1	16
3	21	7	13	10	17
4	2	18	21	16	16
5	9	13	20	15	19

Find out maximum profit possible through optimum assignment.

OR

1 (a) Explain the difference between a T.P. and an A.P. **6**

(b) A travelling salesman has to visit four cities. He wishes to start from a particular city, visit each city once and then return to his starting point. The travelling cost for each city from a particular city is given below : **8**

To city

From city	A	B	C	D
A	–	4	7	3
B	4	–	6	3
C	7	6	–	7
D	3	3	7	–

What is the sequence of visit of the salesman so that the cost is minimum.

2 (a) Explain MODI method for testing the optimality of a solution of a T.P. **6**

(b) Determine an initial basic feasible solution to the following transportation problem using (i) LCM (2) NWCM. **8**

Destinations

Origins	D_1	D_2	D_3	D_4	D_5	Supply
A	5	7	6	8	9	20
B	10	8	10	4	11	35
C	10	12	9	7	8	40
D	6	6	7	8	8	15
Demand	15	10	20	30	35	

OR

2 (a) Describe the transportation problem and describe any one method of finding an initial basic feasible solution. **6**

(b) Find out the optimum solution for transporting the products at a minimum cost for the following transportation problem with cost structure as follows. **8**

Warehouses

		W_1	W_2	W_3	W_4	Supply
Plants	P_1	19	30	50	12	7
	P_2	70	30	40	60	10
	P_3	40	10	60	20	18
	Demand	5	8	7	15	

3 (a) What is linear programming problem ? Explain general mathematical formulation of L.P.P. **6**

(b) Solve the following linear programming problem using graphic method. **8**

Maximize $Z = 80x_1 + 120x_2$

Subject to the constraints :

$$x_1 + x_2 \leq 9$$
$$x_1 \geq 2$$
$$x_2 \geq 3$$
$$20x_1 + 50x_2 \leq 360$$
$$x_1 \geq 0,\ x_2 \geq 0$$

OR

3 (a) Define the following terms : **6**

(i) Slack variable

(ii) Artificial variable

(iii) Surplus variable

(iv) Unbounded solution

(b) Solve the following L.P.P. using Simplex method : **8**

Maximize $Z = 3x_1 + 4x_2$

Sub. to : $2x_1 + 3x_2 \leq 16$

$2x_1 + x_2 \leq 8$

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

4 (a) Explain advantages and characteristics of non-parametric test. **6**

(b) Three groups of students of a class were taught by 3 different methods of finding solution of equations of two variables. Test results are as follows. **8**

Methods	*A* :	80	83	79	85	90	68
	B :	82	84	60	72	86	67	91
	C :	93	65	77	78	88		

Using Kruskal Wallis test, whether three methods are equal or not.

OR

4 (a) Explain the Mann-Whitney U test. **6**

(b) The following data represent the rate of defective work of A to L workers before and after take over of a company. **8**

	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
Before :	8	7	6	9	7	10	8	6	5	8	10	8
After :	6	5	8	6	9	8	10	7	5	6	9	8

On the basis of a paired sign test (Using 10% level of significance) state whether the take over has made any change.

5 (a) Explain meaning and objectives of research. **7**

(b) Explain the principles of good research. **7**

OR

5 (a) Discuss various types of research. **7**

(b) What are the sources of secondary data ? Discuss. **7**