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Y—97—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

(CGPA Pattern)

MATHEMATICS

Paper XV (A)

(Operation Research)

(Tuesday, 19-11-2019) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Attempt any *five* of the following : 2 each

(*a*) Define the objective function.

(*b*) Define the certainty.

(*c*) Define surplus variables.

(*d*) Define an unbounded solution.

(*e*) Define an assignment problem.

(*f*) Explain prohibited assignments.

2. Attempt any *two* of the following : 5 each

(*a*) Explain the standard form of linear programming problem.

(*b*) The manager of an oil refinery must decide on the optimum mix of two possible blending processes of which the input and output production runs are as follows :

P.T.O.

Process	Input		Output	
	Crude A	Crude B	Gasoline X	Gasoline Y
1	6	4	6	9
2	5	6	5	5

The maximum amounts available of crudes A and B are 250 units and 200 units respectively. Market demond shows that at least 150 units of Gasoline X and 130 units of Gasoline Y must be produced. The profits per production run from process 1 and process 2 are ₹ 4 and ₹ 5 respectively. Formulate the problem for maximising the profit.

(*c*) Using the graphical method to solve the linear programming problem

Maximize $z = 2x_1 + 3x_2$

Subject to constraints : $x_1 + x_2 \le 30$,

$$x_1 - x_2 \ge 0$$

$$x_2 \ge 3$$

$$0 \le x_1 \le 20$$

and $0 \le x_2 \le 12$

3. Attempt any *two* of the following : 5 each

(*a*) Explain the iterative procedure of the Big-M method to solve linear programing problem.

(*b*) Prove that, any convex combination of *k* different optimum solutions to a linear programming problem is again an optimum solution to the problem.

(*c*) Obtain the inverse of the martrix $A = \begin{bmatrix} 3 & 2 \\ 4 & -1 \end{bmatrix}$ using the simple method.

P.T.O.

4. Attempt any *two* of the following : 5 each

(*a*) Explain the special cases in assignment problems.

(*b*) A student has to select one and only one elective in each semester and the same elective should not be selected in different semesters. Due to various reasons, the expected grades in each subject, if selected in different semesters, vary and they are given as below.

Semester	**Analysis**	**Statistics**	**Graph Theory**	**Algebra**
I	F	E	D	C
II	E	E	C	C
III	C	D	C	A
IV	B	A	H	H

The grades points are H = 10, A = 9, B = 8, C = 7, D = 6, E = 5 and F = 4. How will the student select the electives in order to maximize the total expected points and what will be his maximum expected total points ?

(*c*) Explain the Hungarian Algorithm to solve the assignment problem.