

(Pages : 3)

S – 6792

Reg. No. :

Name :

Third Semester M.Sc. Degree Examination, February 2024

Mathematics

Elective – I

MM 233.3 : OPERATIONS RESEARCH

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

PART – A

Answer **any five** questions. Each question carries **3** marks.

1. Compare Extreme Point Method and Iso-Profit Method.
2. Explain Vogel's Approximation Method (VAM).
3. State the significance of using PERT/CPM.
4. If $F(X, Y)$ has a saddle point (X_0, Y_0) for every $Y \geq 0$, then prove that X_0 is a minimal point of $f(X)$ subject to the constraints $G(X) \leq 0$.
5. Define Monotonic nondecreasing function.
6. Discuss the steps involved in Big-M Method used for solving LP problem.
7. Discuss the solution Method of assignment Program.
8. Define Critical Path.

(5 × 3 = 15 Marks)

P.T.O.



PART – B

Answer **all** questions. Each question carries **12** marks.

9. (a) Explain Simplex Algorithm (Minimization case).

OR

- (b) If manufacturer produces two different models –X and Y of the same product and Model X makes a contribution of Rs 50 per unit and model Y Rs 30 per unit, towards total profit. Raw materials r_1 and r_2 are required for production. At least 18 kg of r_1 and 12 kg of r_2 must be used daily. Also at most 34 hours of labor are to be utilized. A quantity of 2 kg of r_1 is needed for model X and 1 kg of r_1 for model Y. For each of X and Y, 1 kg of r_2 is required. It takes 3 hours to manufacture model X and 2 hours to manufacture model Y. Then find how many units of each model should be produced in order to maximize the profit?

10. (a) Explain the methods of finding initial solution.

OR

- (b) A solicitors' firm employs typists on hourly piece-rate basis for their daily work. There are five typists and their charges and speed are different. According to an earlier understanding only one job was given to one typist and the typist was paid for a full hour, even if he worked for a fraction of an hour. Find the least cost allocation for the following data:

Typist	Rate per hour (Rs.)	No. of Pages Typed/Hour
A	5	12
B	6	14
C	3	8
D	4	10
E	4	11

Job	No. of Pages
P	199
Q	175
R	145
S	298
T	178



11. (a) Discuss the rules for AOA Network construction.

OR

(b) Explain Forward Pass Method and Backward Pass Method.

12. (a) Find the minimum of $f(X) = (x_1 + 1)^2 + (x_2 - 2)^2$, subject to $g_1(X) = x_1 - 2 \leq 0$, $g_2(X) = x_2 - 1 \leq 0$, $x_1 \geq 0$, $x_2 \geq 0$.

OR

(b) Minimize $f(X) = -x_1 - x_2 - x_3 + \frac{1}{2}(x_1^2 + x_2^2 + x_3^2)$

subject to $g_1(X) = x_1 + x_2 + x_3 - 1 \leq 0$, $g_2(X) = 4x_1 + 2x_2 - \frac{7}{3} \leq 0$,
 $x_1, x_2, x_3 \geq 0$.

13. (a) Prove that in a serial two-stage minimization or maximization problem if

(i) the objective function ϕ_2 is a separable function of stage returns $f_1(X_1, U_1)$ and $f_2(X_2, U_2)$ and

(ii) ϕ_2 is a monotonic nondecreasing function of f_1 for every feasible value of f_2 , then the problem is decomposable.

OR

(b) Minimize $u_1^2 + u_2^2 + u_3^2$ subject to $u_1 + u_2 + u_3 \geq 10$; $u_1, u_2, u_3 \geq 0$.

(5 × 12 = 60 Marks)

