Indian Statistical Institute, Bangalore
MS (QMS) First Year
First Semester - Operations Research I

Final Exam — Date: November 20, 2019
Maximum marks: 70 — Duration: 2 hours

Answer as many questions as you can. Maximum score will be limited to 70

1. State "true" or "false", for each of the following statement. [10]

(i) In an LPP Model, changes in the coefficient of the objective function will definitely result in changing the optimal values of the variables.
(ii) In the Transportation problem solving method, VAM gives the ibfs which is closest to the optimum.
(iii) In the Simplex method, all variables must be nonnegative.
(iv) In the Hungarian method, the feasibility condition for the optimization is that the assignment matrix shall be a square matrix.
(v) Degeneracy can be avoided in LPP if redundant constraint can be deleted.

2. An electric furnace is used to melt iron to make iron grey castings. The product must meet the following material specifications: [10]

a) Carbon: 3.25% to 3.40%
b) Silicon: 2.05% to 2.25%

Material	C %	Si %	Cost/Ton
Steel scrap A	0.45	0.50	Rs 600
Steel scrap B	0.40	0.15	Rs 630
Cast iron scrap	3.50	2.30	Rs 680
Foundry re melt	3.50	2.20	Rs 400

Formulate this problem as a LP Model with appropriate objective function and constraints.

3. The following table gives cost coefficients, demand and availability figures in a standard transportation profile. [5 + 20 = 25]

Sources\ Destination	D1	D2	D3	Total supply
S1	19	20	14	75
S2	15	23	25	75
S3	19	17	20	75
S4	20	31	18	75
Total demand	100	100	100	300

a) Write the corresponding optimization problem in the standard form.
b) Solve the problem giving the least cost transportation plan.

4. Five subjects are to be assigned among six teachers with maximized effectiveness as the required outcome. The teacher-subject effectiveness score is available as below. [25]

Teacher\ Subject	1	2	3	4	5
A	10	20	60	20	30
B	40	80	70	50	50
C	90	40	30	40	50
D	70	30	40	50	40
E	40	10	60	20	20
F	60	50	30	30	30

Solve the assignment problem giving the expected total effectiveness. Which teacher remains unassigned.
