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SARDAR PATEL UNIVERSITY

M.Sc. Examination, II$^{nd}$ Semester

Thursday Date : 28-03-2019

Time :10.00 a.m. to 1.00 p.m.

Subject/Course Code : PSO2ESTA22

OPERATION RESEARCH

Q-1 Answer following. (8)

(1) In queue theory we use

(a) Non linear programming problem.
(b) Gomory constrain.
(c) Dual simplex method.
(d) Non-of-above.

(2) Gomory constrain we use in

(a) Non linear programming problem.
(b) Integer LPP.
(c) Dual simplex method.
(d) Non-of-above.

(3) Kuhn-Tucker condition use in

(a) Non linear programming problem.
(b) Gomory constrain.
(c) Dual simplex method.
(d) Non-of-above.

(4) Little's formula use in

(a) Non linear programming problem.
(b) Integer linear programming problem.
(c) Dual programming problem.
(d) In queue theory.

(4) In usual notation structural change includes

(a) Addition or deletion of variable of constrain.
(b) Discrete change in c and b.
(c) Continuous change in c and b.
(d) Both discrete and continuous change in c and b.

(6) Point $a$ is interior point of set $A$ if every $\epsilon$-neighbour contain

(a) Points which are in set A.
(b) Points which are not in set A.
(c) Points which are in set A and points which not in set A.
(d) It depends on how small $\epsilon > 0$.

(P.T.O.)

(7) In usual notation one use dual simplex method if

(a) $\forall X_{B_i} \geq 0$
(b) At least one $X_{B_i} = 0$
(c) At least one $X_{B_i} > 0$.
(d) At least one $X_{B_i} < 0$.

(8) In lpp any set of $X_j$ which satisfy m constrains is

(a) Feasible solution to lpp.
(b) Optimal feasible solution to lpp.
(c) Solution to lpp.
(d) None of above.

Q-2 Answer following. (14)

(1) In usual notation state name of distribution use in PERT problem. Also justify.

(2) In usual notation definition border Hessain matrix use in operation research.

(3) Write criteria for outgoing basic variable in simplex method for maximization problem.

(4) Write criteria for outgoing basic variable in dual simplex method for maximization problem.

(5) State weak duality theorem.

(6) In usual notation explain critical and non-critical activity in terms of total float.

(7) Explain direct cost.

(8) List out structural change you study in OR.

(9) What do you mean by degenerate solution?

Q-3 A Write note on resources analysis. (6)

Q-3 B Solve following queue problem. (6)
A cashier of medical store can serve five customer per fifteen minutes. Management thought cashier was idle because on average he receive only eighteen customer per hours, on other hand frequent complain of long waiting took place. Compute (1) Average # of customer waiting in queue (2) queue length (3) variance of queue length. (4) variance of queue length

OR

Q-3 B Solve following integer lpp. (6)
Consider following optimal simplex. Find optimal solution in which $X_1$ or $X_2$ is integer.

| $c_j$ | | | 2 | 3 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|
| $c_B$ | $Y_B$ | $X_B = B^{-1}\underline{b}$ | $Y_1$ | $Y_2$ | $Y_3$ | $Y_4$ | $Y_5$ |
| 3 | $y_2$ | 3 | 0 | 1 | 0 | 0 | 1 |
| 2 | $y_1$ | 23/7 | 1 | 0 | 0 | 1/7 | 3/7 |
| 0 | $y_3$ | 1/7 | 0 | 0 | 1 | 3/7 | −40/7 |
| $z = c_B Y_B = 109/7;\ z_j = c_B Y_j$ | | | 2 | 3 | 0 | 2/7 | 27/7 |
| $z_j - c_j$ | | | 0 | 0 | 0 | 2/7 | 27/7 |

Q-4 A Discuss : Five operating characteristic of queue system. (6)

Q-4 B Maximize $z = \log x_1 + \log x_2$ subject to the constraints : $x_1 + x_2 \leq 2$, $x_1 \geq 0, x_2 \geq 0$. (6)

OR

Q-4 B Given the following information (6)

| Activity | 0-1 | 1-2 | 1-3 | 2-4 | 2-5 | 3-4 | 3-6 | 4-7 | 5-7 | 6-7 |
|---|---|---|---|---|---|---|---|---|---|---|
| Duration | 2 | 8 | 10 | 6 | 3 | 3 | 7 | 5 | 2 | 8 |

compute project duration and critical path.

Q-5 A Discuss : Effect of discrete and continuous change in $\underline{b}$ on optimal solution of lpp. (6)

Q-5 B Consider l.p.p : $Max\ z = (4 - 10\lambda)X_1 + (8 - 4\lambda)X_2$; s.t.c. $X_1 + X_2 \leq 4$, (6)
$2X_1 + X_2 \leq 3, X_1 \geq 0, X_2 \geq 0$ and optimal simplex table for $\lambda = 0$.
Compute critical value of $\lambda$.

| $c_j$ | | | 4 | 8 | 0 | 0 |
|---|---|---|---|---|---|---|
| $c_B$ | $Y_B$ | $X_B = B^{-1}\underline{b}$ | $Y_1$ | $Y_2$ | $Y_3$ | $Y_4$ |
| 0 | $y_3$ | 1 | -1 | 0 | 0 | -1 |
| 8 | $y_2$ | 3 | 2 | 1 | 1 | 1 |
| $z = c_B Y_B = 4;\ z_j = c_B Y_j$ | | | 16 | 8 | 0 | 8 |
| $z_j - c_j$ | | | 12 | 0 | 0 | 8 |

OR

(3) (P.T.O.)

Q-5 B Consider l.p.p : $Max\ z = 4X_1 + 8X_2$; s.t.c. $X_1 + X_2 \leq 4 - \theta$, $2X_1 + X_2 \leq 3 - \theta$, (6)
$X_1 \geq 0, X_2 \geq 0$ and optimal simplex table $\theta = 0$.
Compute critical value of $\theta$. Use optimal simplex table given in Q-5 (B).

Q-6 A In usual notation state and prove feasibility criteria for outgoing basic variable. (6)

Q-6 B Consider lpp $Max\ z = 3X_1 + 5X_2 + 4X_3$; s.t.c $2X_1 + 3X_2 \leq 8$, $2X_1 + 5X_3 \leq 10$, (6)
$2X_2 + 4X_3 \leq 15$ and optimal simplex table.

| | | $c_j$ | 3 | 5 | 4 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|
| $c_B$ | $Y_B$ | $X_B = B^{-1}\underline{b}$ | $Y_1$ | $Y_2$ | $Y_3$ | $Y_4$ | $Y_5$ | $Y_6$ |
| 5 | $y_2$ | $50/41$ | 0 | 1 | 0 | $15/41$ | $8/41$ | $-10/41$ |
| 4 | $y_3$ | $62/41$ | 0 | 0 | 1 | $-6/41$ | $5/41$ | $4/41$ |
| 3 | $y_1$ | $89/41$ | 1 | 0 | 0 | $-2/41$ | $-12/41$ | $15/41$ |
| $z = c_B Y_B = 109/7$; $z_j = c_B Y_j$ | | | 2 | 3 | 0 | $45/41$ | $24/41$ | $11/41$ |
| $z_j - c_j$ | | | 3 | 5 | 4 | $45/41$ | $24/41$ | $11/41$ |

Compute : (1) Range for $\Delta b_2$. OR (2) Range for $\Delta C_1$.

— x —

(4)