SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with A+ Grade by NAAC)
Chromepet, Chennai — 600 044.
M.Sc. END SEMESTER EXAMINATION APRIL/NOV - 2021
SEMESTER – IV

17PAMCE4A05 – Operations Research

Total Duration : 3 hrs	**Total Mark : 75**
MCQ : 30 min	MCQ : 15
Descriptive : 2 Hrs. 30 Mins.	Descriptive : 60

Section B

Answer any ***Six*** questions (6 x 5 =30)

1. Write the dual of the following LP problem.
   Minimize $Z = 3x_1 - 2x_2 + 4x_3$ subject to the constraints
   $(i) 3x_1 + 5x_2 + 4x_3 \geq 7$ $(ii) 6x_1 + x_2 + 3x_3 \geq 4$ $(iii)\ 7x_1 - 2x_2 - x_3 \leq 10$
   $(iv) x_1 - 2x_2 + 5x_3 \geq 3$ $(iv) 4x_1 + 7x_2 - 2x_3 \geq 2$ and $x_1, x_2, x_3 \geq 0$.

2. Use dynamic programming to solve the following problem
   Minimize $Z = {y_1}^2 + {y_2}^2 + {y_3}^2$ subject to the constraints
   $y_1 + y_2 + y_3 \geq 15$
   and $y_1, y_2, y_3 \geq 0$.

3. Solve the following LPP by dynamic programming approach
   Maximize $Z = 8x_1 + 7x_2$ subject to the constraints
   (i) $2x_1 + x_2 \leq 8$ $(ii)\ 5x_1 + 2x_2 \leq 15$ and $x_1, x_2 \geq 0$.

4. Explain in detail about thefactors involved in inventory problem analysis.

5. Describe the Inventory control models with shortages (EOQ model with constant demand and fixed reorder cycle time).

6. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter arrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average of 36 minutes.
   Calculate: (a) expected queue size (line length) (b) probability that the queue size exceeds 10.

7. Find the second order Taylor's series approximation of the function
   $f(x_1, x_2) = {x_1}^2 x_2 + 5x_1 e^{x_2}$ about the point $x_0 = [1,0]^T$.

Contd…

8. Find the optimum value of the objective function (by using Kuhn-Tucker method)
   Maximize $Z = 10x_1 - {x_1}^2 + 10x_2 - {x_2}^2$
   subject to the constraints (i) $x_1 + x_2 \leq 8$ (ii) $-x_1 + x_2 \leq 5 x_1, x_2 \geq 0$.

Section C

Part A

Answer any ***Two*** questions (2x 10 =20)

9. Use the revised simplex method to solve the following LPP
   Maximize $Z = 6x_1 - 2x_2 + 3x_3$
   subject to the constraints (i) $2x_1 - x_2 + 2x_3 \leq 2$ (ii) $x_1 + 4x_3 \leq 4$ and $x_1, x_2, x_3 \geq 0$.

10. Describe the single item inventory control models without shortages (EOQ model with constant rate of demand) with suitable diagram.

11. Explain in detail about the structure of a queuing system.

12. Use the Wolfe's method to solve the quadratic programming problem
   Maximize $Z = 2x_1 + x_2 - {x_1}^2$
   subject to the constraints (i) $2x_1 + 3x_2 \leq 6$ (ii) $2x_1 + x_2 \leq 4 x_1, x_2 \geq 0$.

Part B

Compulsory Question (1 x 10 = 10)

13. Use dynamic programming to show that $p_1 \log p_1 + p_2 \log p_2 + \cdots + p_n \log p_n$ subject to constraints $p_1 + p_2 + \cdots + p_n = 1$ and $p_i \geq 0$ $(i = 0,1,2, \ldots n)$ is minimum when $p_1 = p_2 = p_3 = \cdots = p_n = 1/n$.