Registration No : | | | | | | | | | | |

Total Number of Pages : 03 **B.Tech.**
PCI4D003

4th Semester Regular / Back Examination 2017-18
OPTIMIZATION IN CIVIL ENGINEERING
BRANCH : CIVIL
Time : 3 Hours
Max Marks : 100
Q.CODE : C1143
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1 **Answer the following questions : *multiple type or dash fill up type :*** **(2 x 10)**

a) Operations research, which is a very powerful tool for _____.
(i) Research (ii) Decision Making
(iii) Operations (iv) None of the above

b) A basic solution is said to be _____ if any one of the basic variables vanishes.

c) If a constraint is of less than type then _____ variable is used to make it equality type.

d) _____ method is better method to find out initial basic feasible solution.

e) The Hungarian method for solving an assignment problem can also be used to solve.
(i) Transportation Problem,
(ii) Travelling Salesman Problem,
(iii) Both (i) and (ii)

f) The objective functions and constraints are linear relationship between _____
(i) Variables
(ii) Constraints
(iii) Functions

g) Two applications of Dynamic Programming Problems are _____ .

h) Which of the following is not the valid objective function for nonlinear programming problem?
(i) Max z = 2x+3y
(ii) Min z = $3x+10xy+4y^2$
(iii) Max z =6 x $-2xy^2 + 3x^2$

i) Types of integer programming problems are _____.

j) Which of the following parameters is not required to use the Golden Section Search method for optimization?
(i) The lower bound for the search region
(ii) The upper bound for the search region
(iii) The golden ratio
(iv) The function to be optimized

Q2 **Answer the following questions : *Short answer type :*** **(2 x 10)**

a) Differentiate between Cannonical Form and Standard Form.

b) Find Dual problem of the following Primal Problem

$$Max\ z = 7x_1 + 5x_2$$
$$\text{s.t. } 4x_1 + 2x_2 \leq 50$$
$$2x_1 - 4x_2 \leq 90$$
$$5x_1 + 7x_2 = 43$$
$$\text{Where } x_1,\ x_2 \geq 0$$

c) What is degeneracy in Transportation Problem?

d) Explain the Non Linear Programming Problem.

e) Describe K-T conditions.

f) What are the advantages & disadvantages of Fibonacci Search Method and Golden Search Method?

g) Briefly describe Dynamic Programming Problem.

h) What is quadratic programming?

i) Explain branch and bound method.

j) Define Genetic Algorithm.

Part – B (Answer any four questions)

Q3 **a)** Solve the given LPP by Big M Method. **(10)**

$$Max\ z = x_1 + 2x_2$$
$$\text{s. t. } x_1 + 3x_2 \leq 30,$$
$$2x_1 + x_2 \leq 20,$$
$$x_1 + x_2 = 10, \qquad \text{Where } x_1,\ x_2 \geq 0$$

b) Formulate the problem as a L.P.P.. **(5)**

A firm manufactures three products A, B, C. Time to manufacture product A is twice that for B and thrice that for C and if the entire labour is engaged in making product A, 2400 units of this product can be produced. These products are to be produced in the ratio 4 : 2: 3. There is demand for at least 260, 310 and 240 units of products A, B and C and profit earned per unit is Rs. 80/-, Rs. 30/- and Rs. 50/- respectively.

Q4 **a)** Find the optimal solution of the following Transportation Problem by MODI Method. **(10)**

22	**20**	**23**	30
34	**19**	**21**	40
24	**32**	**14**	90
10	80	70	

b) Solve the following assignment problem. **(5)**

12	**19**	**9**	**17**
11	**17**	**15**	**13**
10	**15**	**13**	**12**
17	**12**	**18**	**16**

Q5 **a)** Find the optimal solution to the following Integer Programming Problem. **(10)**

$Max\ z = 2x_1 + 5x_2$

s. t. $x_1 + 2x_2 \leq 4$,

$6x_1 + 2x_2 \leq 9$,

Where $x_1,\ x_2 \geq 0$ and $x_1,\ x_2\ are\ integers$.

b) Describe recursive equation approach to solve Dynamic programming problem. **(5)**

Q6 **a)** Use dynamic programming to solve the following problem : **(10)**

$Min\ z = y_1^2 + y_2^2 + y_3^2$

s.t. $y_1 + y_2 + y_3 \leq 10$

Where $y_1, y_2, y_3 \geq 0$

b) Describe dynamic programming as an approach for optimizing multistage decision process. **(5)**

Q7 **a)** Minimize $\boldsymbol{f(x) = 0.65 - \left[\frac{0.75}{1+x^2}\right] - 0.65\, x\, tan^{-1}(1/x)}$ in interval [0,3] **(10)**

By the Fibonacci Method using n=6.

b) Solve the given NLPP by Kuhn-Tucker Conditions. **(5)**

$Max\ z = 6x_1 + 7x_1^2 - 5x_2^2$

s.t. $x_1 + 2x_2 \leq 10$

$x_1 - 3\,x_2 \leq 9$

Where $x_1,\ x_2 \geq 0$

Q8 **a)** Solve the given Quadratic programming problem **(10)**

Max $z = 2x_1 + 3x_2 - x_1^2 - x_2^2$, s. t. $x_1 + x_2 \leq 2$, Where $x_1,\ x_2 \geq 0$

b) Describe different operations of Genetic Algorithm. **(5)**

Q9 **a)** Solve following problem **(10)**

Min $Z = 25(x_1 - 3x_2)^2 + (x_1 - 3)^2$, s. t. $x_1 + 2x_2 = 9$ using projected gradiant method.

b) Difference and similarities between Genetic Algorithm and Traditional Methods. **(5)**