Sixth Semester BTech Degree Examination

(2013 Scheme)

Branch : Industrial Engineering

13.602 Advanced Operations Research (N)

(MODEL QUESTION PAPER)

Time : 3 Hours Max. Marks : 100

*Instruction: Answer **all** questions in **Part A**. Each question in **Part A** carries **4** marks. Answer **any one full question** from **each** module in **Part B**. Each **full** question in **Part B** carries **20** marks.*

Part A

1. Explain the use of simplex multiplier in revised simplex method.
2. Explain the disadvantages of using preemptive weights in Goal Programming.
3. If a point satisfies the sufficiency conditions for a local minimum, how will you establish that it is a global minimum?
4. What are the conditions under which a node can be fathomed in Branch and Bound algorithm?
5. With a numerical illustration, explain Chinese Postman Problem.

Part B

Module I

6. Woodco sells 3-ft, 5-ft, and 9-ft pieces of lumber. Woodco's customers demand 25 3-ft boards, 20 5-ft boards, and 15 9-ft boards. Woodco, who must meet its demands by cutting up 17-ft boards, wants to minimize the waste incurred. Formulate an LP to help Woodco accomplish its goal, and solve the LP by column generation.

OR

7. Solve the following Linear Programming problem using Revised Simplex method:

$$Max\ Z = x_1 + 2x_2 + 3x_3 + 4x_4$$

subject to

$$3x_1 + 2x_2 + 3x_3 - x_4 \le 25$$
$$-2x_1 + x_2 - 2x_3 + x_4 \ge 5$$
$$2x_1 + 2x_2 + x_3 + x_4 = 20$$
$$x_1, x_2, x_3, x_4 \ge 0$$

Module II

8. Use Beale's method to solve the following Quadratic Programming problem:

$$Max\ Z = 12 - 5x_1 + 2x_1^2 - 2x_1x_2 + 3x_2^2$$

subject to

$$x_1 + 2x_2 \le 12$$

$$3x_1 + x_2 \le 14$$

$$x_1, x_2 \ge 0$$

OR

9. Minimize f (x) = 0.65 − [0.75/(1 + x^2)] − 0.65x $\tan^{-1}$(1/x) in the interval [0,3] by the Fibonacci method using n = 6.

Module III

10. What are the disadvantages of truncating the fractional part of a continuous solution for an integer problem? Use Branch and Bound method to solve the following problem:

Minimize $f = 4x_1 + 5x_2$

subject to

$3x_1 + x_2 \ge 2$

$x_1 + 4x_2 \ge 5$

$3x_1 + 2x_2 \ge 7$

$x_1, x_2 \ge 0$, *integers*

OR

11. Solve the following problem using Gomory's cutting plane method:

Maximize $f = x_1 + 2x_2$

subject to

$x_1 + x_2 \le 7$

$2x_1 \le 11, 2x_2 \le 7$

$x_i \ge 0$ *and integer,* $i = 1, 2$

Module IV

12. During the next four months, a construction firm must complete three projects. Project 1 must be completed within three months and requires 8 months of labor. Project 2 must be completed within four months and requires 10 months of labor. Project 3 must be completed at the end of two months and requires 12 months of labor. Each month, 8 workers are available. During a given month, no more than 6 workers can work on a single job. Formulate a maximum-flow problem that could be used to determine

whether all three projects can be completed on time.

OR

13. Solve the following Travelling Salesman Problem using Branch and Bound method:

--	14	22	22	12
6	--	14	20	8
10	11	--	16	9
18	16	24	--	15
12	8	21	25	--