GUJARAT UNIVERSITY.

M. Phil. (Science) Examination, May 2017

Paper III: STA603 EO

Advanced Operations Research (Optional)

Time: 03 hours   Max. Marks:75

Instructions: (i) Attempt all questions.

   (ii) All questions carry equal marks.

   (iii) Use of scientific calculators and statistical tables permitted.

Q.1 (a) Discuss the changes in the components a_{ij} of the vector $a_j \in B$ for the given LP problem:

   Max. $Z = c^T x$, subject to $Ax = b$, $x \geq 0$.

   (b) Discuss sensitivity analysis with respect to change in (b_i).

OR

Q.1(a) What do you understand by the term sensitivity analysis? Discuss sensitivity analysis with

   respect to addition of a new constraint.

   (b) Discuss sensitivity analysis with respect to addition of a new variable.

Q.2 (a) Define a general nonlinear programming problem. Derive the Kuhn –Tucker necessary

   conditions for an optimal solution to a quadratic programming problem.

   (b) Discuss Beale's method for solving the quadratic programming problem.

OR

Q. 2 (a) Discuss applications of non-linear programming problem.

   (b) Discuss Wolfe's method for solving the quadratic programming problem.

Q.3 (a) Explain with illustrations, resource levelling in a project.

   (b) Discuss matrix solution method in network analysis.

OR

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Q.3 (a) What are the requirements for the application of PERT? Give an algorithm for PERT and state the limitations of this technique.

(b) Show that a simple graph with n vertices and k components can have at most (n – k) (n – k + 1)/ 2 edges.

Q.4 (a) What do you understand by a queue? Give some important applications of queueing theory.

(b) Discuss M/ D/ C queueing system.

OR

(a) Discuss (M/ G/ 1) : (∞/ FCFS) queueing system.

(b) Derive the difference equations for the queueing model (M/ M/ 1): (N/ FCFS) . How would you proceed to solve the model?

Q.5 (a) Explain inventory control system. Describe the factors involved in Inventory analysis.

(b) The probability distribution of monthly sales of a certain item is as follows:

Monthly sales: 0   1   2   3   4   5   6

    Probability: 0.03 0.05 0.29 0.26 0.20 0.10 0.07

The cost of carrying inventory is Rs. 18 per unit per month. The current policy is to maintain a stock of four items at the beginning of each month. Assuming that the cost of shortage is proportional to both time and quantity short, obtain the imputed cost of a shortage of one item for one time unit.

OR

Q.5 (a) What are the categories of costs that are associated with in developing a sound inventory model? What are the components of cost under each of them?

(b) Derive the rule that gives the optimum order quantity for a single period probabilistic inventory system for which the holding cost and shortage cost are proportional to time and quantity. Assume that the demand is discrete.