

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2008–09 & thereafter)

SUBJECT CODE : MT/ME/OT54

B. Sc. DEGREE EXAMINATION, NOVEMBER 2011
BRANCH I - MATHEMATICS
FIFTH SEMESTER

COURSE : MAJOR – ELECTIVE
PAPER : OPTIMIZATION TECHNIQUES
TIME : 3 HOURS

MAX. MARKS : 100

Answer Any Six Questions (each carrying 17marks)

1. Use the three point interval search to approximate the location of the maximum of $f(x) = x(5\pi - x)$ on $[0, 20]$ to within $\varepsilon = 1$.
2. Use the Newton- Raphson method to maximize $z = -(x_1 - \sqrt{5})^2 - (x_2 - \pi)^2 - 10$ to within a tolerance of 0.05.
3. Solve the following program by use of the Kuhn-Tucker conditions:
Minimize $z = x_1^2 + 5x_2^2 + 10x_3^2 - 4x_1x_2 + 6x_1x_3 - 12x_2x_3 - 2x_1 + 10x_2 + 5x_3$
Subject to: $x_1 + 2x_2 + x_3 \geq 4$ with all variables nonnegative
4. Use the penalty function approach to
Minimize $Z = (x_1 - x_2)^2 + (x_3 - 1)^2 + 1$
Subject to $x_1^5 + x_2^5 + x_3^5 = 16$
5. A presidential nominee has reduced the field of possible Vice Presidential running mates to three people. Each of these candidates has been rated on a scale from .1 (lowest) to 10 (highest) : person 1 received 10 points, person 2 received 8 points, and person3 received 5points. The probability of person i ($i = 1,2,3$) accepting the j^{th} ($j = 1,2,3$) offer to run for Vice President (assuming the first $j-1$ offers, to other people, were declined) is denoted by
 P_{ij} where $p_{11} = 0.5$ $p_{12} = 0.2$ $p_{13} = 0$
 $p_{21} = 0.9$ $p_{22} = 0.5$ $p_{23} = 0.2$
 $p_{31} = 1$ $p_{32} = 0.8$ $p_{33} = 0.4$
In what order should the three potential running mates be offered the Vice Presidential Nomination if the presidential nominee wants to maximize the expected number of Points ?

6. Is the Stochastic matrix

$$P = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0.4 & 0 & 0.6 & 0 \\ 0.2 & 0 & 0.1 & 0.7 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

regular? Ergodic? Calculate $L = \lim_{n \rightarrow \infty} P^n$, if it exist.

7. (a) Write a short notes on KENDALL'S NOTATION. (5marks)
- (b) A new television set arrive for inspection every 3 min and is taken by a quality control engineer on a first-come, first- served basis. There is only one engineer on duty, and it takes exactly 4 min to inspect each new set. Determine the average number of sets waiting to be inspected over the first half-hour of a shift, if there are no sets awaiting inspection at the beginning of the shift. (12 marks)
8. A gourmet delicatessen is operated by one person, the owner. The arrival pattern of customers on Saturdays appears to follow a Poisson distribution, with a mean arrival rate of 10 people per hour. Customers are served on a FIFO basis, and because of the reputation of the store they are willing to wait for service once they arrive. The time it takes to serve a customer is estimated to be exponentially distributed, with an average service time of 4 min. Determine (a) the probability that there is a queue, (b) the average size of the queue,(c) the expected time that a customer must wait in the queue, and (d) the probability that a customer will spend less than 12 min in the store.

