MASTER OF ARTS (ECONOMICS)

Term-End Examination

December, 2007

MEC-003 : QUANTITATIVE METHODS

Time : 3 hours *Maximum Marks : 100*

Note : *Answer **two** questions from Section A, **four** from Section B and **two** from Section C.*

SECTION A

*Answer any **two** questions from this section.* 2×20

1. (i) When would you like to formulate a problem with the help of differential equation ? If you are given a differential equation of the form

$$\frac{dy}{dt} + u(t)y = w(t)$$

where u and w are two functions of t, as is also y, what will you do to reduce it to a first order linear differential equation ? Write its homogeneous and non-homogeneous forms and list the steps you would like to follow for obtaining their solutions.

(ii) Find the general and particular solutions of the equation

$$\frac{dy}{dt} + 4y = 12; \quad y(0) = 2$$

2. A production function is given as $y = x_1^{2/3} x_2^{1/5}$, where x_1 and x_2 are two inputs and y is output. If the output and inputs prices are known to be P_y = Rs. 15, w_1 = Rs. 5 and w_2 = Rs. 3, then

(i) derive the inputs that maximise profit

(ii) verify that these inputs are the profit maximising ones with the help of Hessian matrix.

3. (i) Do you agree with the proposition that the normal distribution is a limiting case of binomial distribution ? Give reasons in support of your answer.

(ii) The mean height of 1000 men is 67 inches and their standard deviation is 6 inches. If the heights are normally distributed, how many of them have a height between 63 and 65 inches ?
(Given that $P\{|z| \geq 0{\cdot}67\} = 0{\cdot}2484$ and
$P\{|z| \geq 0{\cdot}33\} = 0{\cdot}1293$, where z is standard normal variate)

4. (i) When would you like to opt for an interval estimation instead of point estimation ? If you are asked to explain the meaning of
$P\{-1{\cdot}96 \leq z \leq 1{\cdot}96\} = 0{\cdot}95$, what points must you highlight ?

(ii) It is known that weight of sand in packed bags is distributed normally with a standard deviation of 0·2 kg. A sample of 25 bags is picked up at random and the mean weight is found to be 49·7 kg. If you want to find a 90% confidence interval for the mean weight of sand filled bags, in what interval limits does the mean lie ?
(It is given that $P(|z| \geq 1{\cdot}645) = 0{\cdot}9$)

SECTION B

*Answer any **four** questions from this section.* 4×10

5. Expand the function $f(x) = 5 + 2x + x^2$ around $x_0 = 1$ with $n = 3$.

6. Find the inverse of the matrix

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 3 & 10 & 6 \\ 2 & 5 & 5 \end{bmatrix}$$

7. The technology matrix (A) below represents relationships between industries of farming, construction and clothing.

$$A = \begin{bmatrix} 0 & 0.3 & 0.3 \\ 0.3 & 0.1 & 0.1 \\ 0.2 & 0.4 & 0 \end{bmatrix}$$

If the final demand vector (D) is given as

$$D = \begin{bmatrix} 180 \\ 20 \\ 90 \end{bmatrix},$$

find the output levels of these three industries.

8. Using the following data, obtain the regression equations Y on X and X on Y :

X	5	3	8	5	9
Y	8	9	6	9	8

9. An urn contains 8 green balls, 12 black balls and 20 red balls. If two balls are drawn at random, what is the probability that these are red balls ?

10. Discuss the concepts of sampling with and without replacement.

SECTION C

*Answer any **two** questions from this section.* 2×10

11. (i) Roll a fair die and let X be the number obtained. What is its expected value ?

(ii) Determine whether the following matrix is positive definite :

$$\begin{pmatrix} -3 & 4 \\ 4 & 6 \end{pmatrix}$$

12. Write short notes on :

(i) Kuhn-Tucker condition

(ii) Coefficient variation

13. Differentiate between any ***two*** of the following :

(i) Difference and Differential equations

(ii) Primal and Dual programming formulations

(iii) t-test and F-test