SUBJECT CODE: 11EC/PE/MM34

M.A. DEGREE EXAMINATION NOVEMBER 2013
BRANCH   III – ECONOMICS
THIRD SEMESTER

COURSE   : ELECTIVE
PAPER   : MATHEMATICAL METHODS
TIME   : 3 HOURS   MAX.MARKS : 100

SECTION – A

ANSWER ANY <u>FIVE</u> QUESTIONS. EACH ANSWER NOT TO EXCEED 300 WORDS: **(5 X 8 = 40)**

1. If x be the number of workers employed, the average cost of production is given by
    AC = $\frac{3}{2(x-4)}$ +24x . Show that x = 4.25 will make the expression minimum. In the
    interest of the management will you then advise to employ 4 or 5 workers? Give
    reasons for your answer.

2. Verify Eulers theorem for the function $Z = x^2 e^{y/x}$.

3. There are 2 families A and B. There are 2 men, 3 women and 1 child in family A and
    1 man, 2 women and 4 children in family B.   The recommended daily allowance for
    calories is Man: 2400, Woman: 1900, Child 1800 and for proteins is Man:55gm,
    Woman:45 gm and Child:33 gms. Represent the above information by matrices.
    Using matrix multiplication, calculate the total requirements of calories and proteins
    for each of the 2 families.

4. Find the inverse of the matrix

    $\begin{bmatrix} 4 & -2 & 1 \\ 7 & 3 & 3 \\ 2 & 0 & 1 \end{bmatrix}$

5. Find the consumer surplus at the equilibrium price and quantity under pure
    competition for demand function p = $\frac{8}{q+1}$ -2 and supply function p = $\frac{1}{2}$ $(q + 3)$ where
    p is price and q is the quantity.

6. Prove that $y = 2cx^2 + c^2$ is the solution of the equation $\left[\frac{dy}{dx}\right]^2$ +8x² $\left[\frac{dy}{dx}\right]$ = 16x²y
    and find the definite solution that satisfies y(1) = (-1)

7. Find the solution to the following game

    $\begin{bmatrix} 2 & -1 \\ 0 & 2 \end{bmatrix}$

SECTION – B

ANSWER ANY <u>THREE</u> QUESTIONS: EACH ANSWER NOT TO EXCEED 1200 WORDS: (3 X 20 = 60)

8. A company has 2 machines with which it can manufacture either bottles or tumblers. The first of the 2 machines has to be used for one minute and the second for 2 minutes in order to manufacture a bottle and the 2 machines have to be used for one minute each to manufacture a tumbler. During an hour the 2 machines can be operated for at the most for 50 and 54 minutes respectively. Assuming that it can sell as many bottles and tumblers as it can produce, find how many bottles and tumblers it should manufacture so that it profit per hour is maximum being given that it gets a profit of 10 paise per bottle and 6 paise per tumbler.

9. A discriminating monopolist is able to separate its customers into 2 markets with respective demand functions as $X_1 = 21 – 0.1P_1$ and $X_2 = 50 – 0.4P_2$, P1 and P2 being prices and X_1 and x_2 being quantities demanded. The total cost function of the monopolist is $TC = 1-X + 2000$ where $X = X_1 + X_2$ is total output.
   (i) Find the profit maximizing values of X_1 and X_2.
   (ii) Find the prices charged in each market and the maximum profits.
   (iii) Find the elasticity of demand in the markets and verify that higher price will be charged in the market having the lower price elasticity of demand.

10. Determine the total demand for industries 1, 2 and 3 given the matrix of technical coefficients A and the final demand vector B below

$$A = \begin{bmatrix} 0.4 & 0.3 & 0.1 \\ 0.2 & 0.2 & 0.3 \\ 0.2 & 0.4 & 0.2 \end{bmatrix} \qquad B = \begin{bmatrix} 140 \\ 220 \\ 180 \end{bmatrix}$$

11. Explain the cobweb model using difference equations.

12. Find the Eigen values and eigen vectors for the following matrix A

$$A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 3 & 0 & 5 \end{bmatrix}$$

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