D 93158 (Pages : 4) Name.....

Reg. No.....

FIRST SEMESTER M.A. DEGREE EXAMINATION, DECEMBER 2015

(CUCSS)

Economics

EC 01 C04—QUANTITATIVE METHODS FOR ECONOMIC ANALYSIS–I

(2015 Admissions)

Time : Three Hours Maximum : 36 Weightage

Part A

Answer **all** *questions.*
weightage 1.

1. Show that $\begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$ is nil potent of index 2.

2. Find the rank of $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$.

3. Obtain the characteristic roots of the matrix $\begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$.

4. If $y = x^2 \log x$, find $\frac{dy}{dx}$.

5. The supply y of a commodity at the price x is given by $y = 4x^2 - x + 3$. Find the rate at which supply is changing when the price is 20.

6. Given a utility function $u = f(q_1, q_2)$, where u is the utility and q_1, q_2 are commodities. Find du.

7. The cost of manufacturing a certain article is given by $C = 5 + \frac{48}{x} + 3x^2$, where x is the number of articles manufactured. Find the minimum value of C.

Turn over

8. Integrate $(x^2 + 3x - 4)(2x - 3)$ with respect to x.

9. Find $\int \frac{x}{\sqrt{x^2 + a^2}}\, dx$.

10. State the classical definition of probability. What are its limitations ?

11. Evaluate k if $p(x) = k$, $x = 1, 2, 3, 4, 5, 6$ and 0 elsewhere, is a probability mass function.

12. State Bayes theorem.

(12 × 1 = 12 weightage)

Part B

Answer any **eight** *questions.*
weightage 2.

13. Show that the matrix $\begin{bmatrix} 3 & 3+4i & 4-5i \\ 3-4i & -4 & 5+6i \\ 4+5i & 5-6i & 0 \end{bmatrix}$ is hermitian.

14. Find the adjoint and the inverse of the matrix $\begin{bmatrix} 2 & 3 & -1 \\ 0 & 1 & -1 \\ 2 & 1 & 2 \end{bmatrix}$.

15. Show that the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ satisfies the equation $A^3 - 6A^2 + 9A - 4I = 0$. Hence find the inverse of A.

16. If $y = 10x^3 + 5x^2$, show that $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + 6y = 0$.

17. If the demand law is $p = \frac{10}{(x+1)^2}$, find the elasticity of demand in terms of x. If the quantity x is 4 units find the elasticity of demand.

18. Given a production function $P = kL^{\alpha}C^{\beta}$, where P is product, L is labour, C is capital, and k, α and β are contants. Find dP.

19. Find the maximum and minimum values of $y = 2x^3 - 3x^2 - 12x + 4$.

20. Find the minimum of $u = 6x^2 + y^2$ under the condition that $4x - y = 1$. What is the value of u ?

21. Evaluate $\int x^2 e^{3x}\, dx$.

22. A problem in Statistics is given to students A, B, C, D and E whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ and $\frac{1}{6}$ respectively. What is the probability that the problem will be solved ?

23. Explain with examples the rules of addition and multiplication theorems of probability.

24. A player tosses 2 coins. If two head appear he wins Rs. 10. If one head turns he wins Rs. 5. But if two tails turn he must pay Rs. 7 penalty. Calculate the expected value of the game of him.

(8 × 2 = 16 weightage)

Part C

Answer any **two** *questions.*
weightage 4.

25. Solve the following using matrix method :

$$5x + 3y + 3z = 48$$
$$2x + 6y - 3z = 18$$
$$8x - 3y + 2z = 21.$$

26. (a) A company finds that it can sell out a certain item for Rs. 2.00 per unit. The cost function estimated to be $100 + \frac{1}{2}\left(\frac{q}{20}\right)^2$. What is the average cost when 100 units are produced ? Find the marginal revenue and marginal cost.

(b) Find the total derivative of u with respect to t if $u = x^2 + xy + y^3$; $x = t^3$, $y = t^3 + t^2$.

Turn over

27. (a) A radio manufacturer produces x sets per week at a total cost of Rs. $x^2 + 78x + 2500$. The demand function is $8x = 600 - p$, where p is the price per unit. When is the net revenue maximum ? What is the price per set then ?

(b) A firm sells a product at Rs. 9 per unit. The total cost of the firm for producing x units is given by $C = 20 + 0.6x + 0.01x^2$. How many units should be made to achieve maximum profit ? Verify that the condition for a maximum is satisfied.

28. On an average 20% of persons going to a handicraft emporium are foreigners and the remaining 80% are local persons, 75% of such foreigners and 50% of such local persons are found to make purchases. If a bundle of purchased items is sent to the cash counter, what is the probability that the purchaser is a foreigner ?

($2 \times 4 = 8$ weightage)