D 100281 (Pages : 4) Name.....

Reg. No.....

SIXTH SEMESTER U.G. (CUCBCSS—UG) DEGREE EXAMINATION MARCH 2024

Economics

ECO 6B 12—MATHEMATICAL ECONOMICS

(2018 Admissions only)

Time : Three Hours Maximum : 80 Marks

Part A (Objective Type Questions)

Answer all **twelve** *questions.*
Each question carries ½ mark.

1. Given the Cobb- Douglas Production function $Q = A K^{\alpha} L^{\beta}$, refers to :

   (a) Managerial efficiency. (b) Marginal productivity.

   (c) Marginal profit. (d) Marginal revenue.

2. The elasticity of technical substitution measured by using :

   (a) Indifference curve. (b) Isoquant.

   (c) Total product curve. (d) Isocost

3. In linear programming, most popular non-graphical procedure is classified as :

   (a) Linear procedure. (b) Non-graphical procedure.

   (c) Graphical procedure. (d) Simplex method.

4. Feasible region's optimal solution for a linear objective function always includes :

   (a) Downward point. (b) Upward point.

   (c) Corner point. (d) Front point.

5. The income elasticity of demand is high for :

   (a) Shelter. (b) Luxuries.

   (c) Clothing. (d) Medicine.

Turn over

6. If the price elasticity of demand is unity, then a fall in price :

   (a) Reduces revenue.

   (b) Leaves revenue unchanged.

   (c) Increases revenue.

   (d) Reduces costs.

7. At the point of consumer equilibrium :

   (a) The indifference curve is tangent to the budget line.

   (b) The MRSxy equals P_X/P_Y.

   (c) $MU_X/P_X = MU_Y/P_Y$.

   (d) All the Above.

8. In Linear Programming, we optimize :

   (a) An objective function subject to the inequality constraints.

   (b) Constraint inequalities subject to the objective function.

   (c) Objective constrains subject to the inequality function.

   (d) All of the above.

9. If we plot capital on the vertical axis and labour on the horizontal axis, the slope of a straight line isocost drawn such a graph is :

   (a) P_L/P_K. (b) P_K/P_L.

   (c) $-P_L/P_K$. (d) – PK/PL.

10. When the marginal cost is less than the average cost, the average cost is :

    (a) Rising. (b) Falling.

    (c) Constant. (d) Equal to MC.

11. When the perfectly competitive firm and industry are both in the long run equilibrium :

    (a) P = MR = SMC = LMC.

    (b) P = MR = SAC = LAC.

    (c) P = MR = lowest point on the LAC curve.

    (d) All the above.

12. Who among the following developed input output analysis ?

(a) Pigou. (b) Hicks.

(c) Marshall. (d) Leontief.

(12 × ½ = 6 marks)

Part B

Answer any **ten** *questions.*
Each question carries 2 *marks.*

13. Define elasticity of substitution

14. Convert the following primal problem into dual problem :

MAX $4X + 6Y$

S.A. $2X + 4Y \leq 12$

$4X + 3Y \leq 16$

$X \geq 0$ $Y \geq 0$.

15. What is input-output analysis ?

16. Prepare a note on Euler's Theorem.

17. Define monopoly market.

18. What are non-negativity constraints ?

19. Define demand function.

20. What is meant by an economic model ?

21. State the first order condition for consumer equilibrium for a given utility function $U = f(Q_1, Q_2)$ and the budget constraint $M = P_1Q_1 + P_2 Q_2$.

22. Find the AP, MP for the production function $Q = 10 K^{0.7}L^{0.1}$.

23. What is optimal solution ?

24. Distinguish between homogeneous and non homogeneous production functions.

(10 × 2 = 20 marks)

Part-C

Answer any **six** *questions.*
Each question carries 5 *marks.*

25. Determine the profit maximizing condition of a multi plant monopolist.

26. Explain the features of perfect competition.

Turn over

27. Explain meaning, uses of input output model.

28. Find solution to the linear programming problem

Maximize $Z = X_1 + 1.5 X_2$

Subject to the Constraint :

$2X_1 + 2X_2 \leq 16$

$X_1 + 2X_2 \leq 12$

$4X_1 + 2X_2 \leq 28$

$X_1, X_2 \geq 0.$

29. Discuss the meaning and significance of Lagrange multipliers.

30. Explain MPS and MPC. Why is MPS + MPC always equal to one ?

31. Determine the relation between price and elasticity under monopoly market

32. Define MRTS. Determine MRTS of labor for capital using the information given in the following table

Factor Combinations	*Units of Labor*	*Units of Capital*	*Units of Output of Commodity X*	*MRTS of Labor for Capital*
A	1	15	150	—
B	2	11	150	—
C	3	8	150	—
D	4	6	150	—
E	5	5	150	—

(6 × 5 = 30 marks)

Part D

Answer any **two** *questions.*
Each question carries 12 *marks.*

33. Explain meaning and importance of mathematical economics. Prove the use of mathematical economics in economic models using demand function.

34. State and illustrate the conditions for the equilibrium of a firm under perfect competition.

35. Prove that Cobb-Douglas production function is a linear homogeneous production function of degree one. Identify and prove its other important properties.

36. Discuss important marginal concepts in economics.

(2 × 12 = 24 marks)

C 40281 (Pages : 4) Name.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION MARCH 2023

Economics

ECO 6B 12—MATHEMATICAL ECONOMICS

(2017—2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A (Objective Type Questions)

Answer **all** *twelve questions.*
Each question carries ½ mark.

1. Input output analysis was developed by :

   (a) Hicks. (b) Marshall.

   (c) Leontief. (d) Gossen.

2. Cobb-Douglas production function satisfies :

   (a) Coase Theorem. (b) Euler's Theorem.

   (c) Hawk ' s Theorem. (d) Arrow's Theorem.

3. Identify the equilibrium condition of firm under perfect competition :

   (a) MC=MR.

   (b) MC curve must be falling at the point of equilibrium.

   (c) Both (a) and (b).

   (d) None of these.

4. Assume that Price = 10. Identify MR at the point on the demand curve where e = 0.5 ?

   (a) 1. (b) 5.

   (c) 10. (d) – 10.

5. Lagrange multiplier is a mathematical method for :

   (a) Minimization. (b) Maximization

   (c) Constraint optimization. (d) None of these.

Turn over

6. Shut down point is the point where :

(a) MC = MR. (b) P = MC.

(c) AVC = AR. (d) Price = AVC.

7. All of the solutions possible in the face of existing constraints are called :

(a) Optimal solution. (b) Feasible.

(c) Primal solution. (d) Dual solution.

8. When the marginal cost is less than average cost, the average cost :

(a) Rises. (b) Falls.

(c) Remains constant. (d) None of these.

9. The price elasticity of demand is a negative number which means :

(a) Demand is price elastic.

(b) Demand is price inelastic.

(c) The demand curve is downward sloping.

(d) An increase in income will reduce the quantity demanded.

10. Dual of the dual is :

(a) Dual itself. (b) Primal.

(c) Alternative. (d) None of the above.

11. ———— is the first order derivative of total utility :

(a) Average utility. (b) Marginal utility.

(c) Cardinal utility. (d) Maximum utility.

12. If an increase in income from 1000 to 1500 leads to rise in saving from 300 to 500, MPS is :

(a) 0.8. (b) 0.6.

(c) 0.5. (d) 0.4.

(12 × ½ = 6 marks)

Part B

Answer any **ten** *questions.*

Each question carries 2 *marks.*

13. Define MRTS.
14. Assume that the supply function is $X = 2P^5 + 5$. Find elasticity of supply when $P = 3$.
15. What is meant by price discrimination ?
16. Compute marginal utility from the total utility function $U = 5x^3 + 10x^2 + 12x + 9$
17. State Euler's theorem.
18. What is MPS ?
19. Define profit function.
20. What do you mean by discriminating monopoly ?
21. Define Mathematical economics.
22. What is optimal solution ?
23. What is meant by linear homogeneous production function ?
24. Define production possibility curve.

(10 × 2 = 20 marks)

Part C

Answer any **six** *questions.*

Each question carries 5 *marks.*

25. Explain the properties of Cobb- Douglas production function.
26. Assume that a firm's total cost function is $TC = Q^3 - 30Q^2 + 400Q + 500$. At what level of output is the firm's marginal cost equal to rupees 100 ?
27. Explain multivariable functions with suitable example
28. Find the AP, MP and output elasticity of capital and labour for the production function

    $Q = 10K^{0.7}L^{0.1}$.
29. Explain the assumptions of linear programming.
30. Define input output analysis. Explain the assumptions of input-output model.

Turn over

31. Examine the relationship between AR and MR with the help of a diagram.

32. Illustrate the relationship between primal and dual using an example.

(5 × 6 = 30 marks)

Part D

Answer any **two** *questions.*

Each question carries 12 *marks.*

33. Explain the meaning and derivation of the concept of elasticity. Differentiate between price elasticity, income elasticity and cross elasticity

34. Explain linear programming. Solve using the Graphical method the following problem:

Maximize $Z = 3x + 2y$

subject to : $2x + y \leq 18$

$2x + 3y \leq 42$

$3x + y \leq 24$

$x \geq 0, y \geq 0.$

35. Define perfect competition. Explain the conditions for the equilibrium of a firm under perfect competition

36. What do you mean by optimisation ? Discuss the economic applications of optimisation

(2 × 12 = 24 marks)

C 20327 **(Pages : 4)** **Name.....**

Reg. No.....

SIXTH SEMESTER (CUCBCSS–UG) DEGREE EXAMINATION, MARCH 2022

Economics

ECO 6B 12—MATHEMATICAL ECONOMICS

(2014 to 2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Answers may be written **either** *in English* **or** *in Malayalam.*

Part A

Answer **all** *questions.*
Each question carries ½ mark.

1. In graphical solutions of linear inequalities, solution can be divided into :
   (a) One subset. (b) Two subsets.
   (c) Three subsets. (d) Four subsets.

2. What is a, if $B = \begin{bmatrix} 1 & 4 \\ 2 & a \end{bmatrix}$ is a singular matrix ?
   (a) 5. (b) 6.
   (c) 7. (d) 8.

3. If $A = \begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A| = ?$
   (a) 2. (b) 3.
   (c) 4. (d) 5.

4. If marginal costs equal average total costs :
   (a) Average total costs are falling. (b) Average total costs are maximized.
   (c) Average total costs are rising. (d) Average total costs are minimized.

5. A consumer product has a Price Elasticity of Demand of – 0.12. Which of the following factors would not help to explain this ?
   (a) There are few substitutes available.
   (b) Any substitutes there are have higher prices.
   (c) The product accounts for a small percentage of consumer expenditure.
   (d) The product is a normal good.

Turn over

6. Which of the following statements about graphs of short-run costs curves is false ?
   (a) The AFC at each output equals the gap between the SAC and AVC curves at that output.
   (b) The SMC curve lies above the MVC curve.
   (c) The MVC curve intersects the lowest point on the AVC curve.
   (d) The SMC curve intersects the lowest point on the SAC curve.
7. The price of product X falls and this change increases the demand for product Y, then :
   (a) X and Y are complements. (b) X and Y are substitutes.
   (c) X is an inferior good. (d) Y is an inferior good.
8. In linear equation '$ax + by = c$' a and b cannot be equal :
   (a) To rational numbers. (b) To one.
   (c) To zero. (d) Set of even numbers.
9. Matrix having only one row is classified as :
   (a) Row vector. (b) Column vector.
   (c) Dimension vector. (d) Direction vector.
10. In matrices, inter-industry demand is summarized as :
   (a) Input-output matrix. (b) Output-input matrix.
   (c) Linear buying matrix. (d) Linear selling matrix.
11. According to determinant properties, multiple of one row is added to another row then determinant :
   (a) Changed. (b) Unchanged.
   (c) Multiplied. (d) Added.
12. In transpose of matrix A, columns of matrix A becomes :
   (a) Multiple column. (b) Rows.
   (c) Multiples. (d) Divisors.

(12 × ½ = 6 marks)

Part B (Very Short Answer Questions)

Answer any **ten** *questions.*
Each question carries 2 *marks.*

13. If $a = 100$ and $b = 2$, obtain the linear supply function.
14. Define Utility function.
15. Define price elasticity of demand.
16. Define consumer equilibrium.

17. Define income elasticity.
18. Explain homogeneous production function.
19. Define Marginal utility.
20. Explain the properties of Cobb Douglas production function.
21. Define Marginal Rate of Substitution.
22. Write a note on marginal and total revenue.
23. Write a note on measurement of elasticity of demand.
24. Explain production possibility curve.

(10 × 2 = 20 marks)

Part C (Short Essay Questions)

Answer any **six** *questions.*
Each question carries 5 *marks.*

25. If D = $-50p + 250$ and S = $25p + 25$ are the demand and the supply functions of a certain product. Plot both the curves on a graph sheet and obtain both the equilibrium price and quantity.
26. Explain the conditions of market equilibrium.
27. If D = $600 - 100p$ stands for the law of demand then find the elasticity of demand when price is 4.
28. Write a note on Leontief input-output analysis.
29. Determine the equation of the straight line if y intercept is – 5 and slope is (– 5/8).
30. Explain the conditions for price output determination under monopoly.
31. Explain the various methods for measuring elasticity of demand.
32. Explain short run production function.

(6 × 5 = 30 marks)

Part D (Essay Questions)

Answer any **two** *questions.*
Each question carries 12 *marks.*

33. Explain supply and demand function of a certain commodity are S = 50 + 2P and D = 100 – 3P respectively :
    (i) Calculate equilibrium price and quantity.
    (ii) When an advalorem tax of 50 % is levied, calculate the new equilibrium price and quantity ?
    (iii) If a specific tax of Rs. 5 per unit is imposed. Calculate new equilibrium values.

Turn over

34. The monopolist's demand curve is X = 200 – 2p, or p = 100 – 0.5 X. The costs of the two plants are $C_1 = 10x_1$ and $C_2 = 0.25x_2^2$. Find the profit of the firm at this level of output.

35. Solve the following LPP graphically :

Minimize $C = 6x_1 + 11x_2$

subject to the constraints

$$2x_1 + x_2 \geq 104$$
$$x_1 + 2x_2 \geq 76$$
$$x_1, x_2 \geq 0.$$

36. Explain the necessary and sufficient conditions for equilibrium of a firm under perfect competition.

(2 × 12 = 24 marks)

C 1381 (Pages : 4) Name.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
MARCH 2021

Economics

ECO 6B 12—MATHEMATICAL ECONOMICS

Time : Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions.*
Each question carries 1 *mark.*

1. The relationship between marginal revenue and price is given by :

   A) $MR = p(1 - 1/e)$. B) $MR = p(e - 1/e)$.

   C) $MR = p(1 - e)$. D) $MR = p(e - p/e)$.

2. Lagrange multiplier is a mathematical method for :

   A) Constraint optimization. B) Minimization.

   C) Maximization. D) None of these.

3. The rate at which a consumer can give up some amount of one good in exchange for another good while maintaining the same level of utility is called :

   A) Price elasticity. B) MRS.

   C) MRTS. D) PPC.

4. What is the shape of the demand curve faced by a firm under perfect competition ?

   A) Horizontal. B) Vertical.

   C) Positively sloped. D) Negatively sloped.

5. Given the Cobb-Douglas Production function $Q = A K^{\alpha} L^{\beta}$, 'A' refers to :

   A) Managerial efficiency. B) Marginal productivity.

   C) Marginal profit. D) Marginal revenue.

Turn over

6. When the demand curve of a monopolist is $Q = a - bP$, then the total revenue is given by :

A) $a - bPQ$. B) $a - bQ$.

C) $aP - bP$. D) $aP - bP^2$.

7. If the percentage increase in the quantity of a commodity demanded is smaller than the percentage fall in its price, the coefficient of price elasticity of demand is :

A) Greater than one. B) Equal to one.

C) Smaller than one. D) Zero.

8. If the $MRTS_{LK}$ equals 2, then the MP_K/MP_L is :

A) 2. B) 1.

C) $\frac{1}{2}$. D) 4.

9. When the total product reached at its maximum, marginal product is :

A) Zero. B) Negative.

C) Positive. D) Indeterminate.

10. Dual of the dual is :

A) Dual. B) Primal.

C) Alternative. D) None of the above.

11. The output elasticity of labour measures :

A) $(\Delta Q)/(\Delta L)$. B) $(\% \Delta Q)/(\% \Delta L)$.

C) $(\Delta L)/(\Delta Q)$. D) $(\% \Delta L)/(\Delta L)$.

12. The price elasticity of demand measures :

A) The slope of a budget curve.

B) How often the price of a good changes.

C) How sensitive the quantity demanded is to changes in demand.

D) The responsiveness of the quantity demanded to changes in price.

(12 × 1 = 12 marks)

Section B

Answer at least **six** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 18.

13. What is an objective function ?

14. Define Market

15. Convert the following primal problem into dual problem :

Maximize $4X + 6Y$
S.A. $2X + 4Y \leq 12$
$4X + 3Y \leq 16$
$X \geq 0\ Y \geq 0.$

16. What do you mean by factor intensity ?

17. Define utility theory.

18. What is meant by linear homogeneous production function ?

19. Interpret the consumption function formula, $C = a + b\ Yd$.

20. *The profit function equation is made up of two primary functions.* Identify them.

21. What is optimal solution ?

22. What is an indirect utility function ?

23. Can AC fall, when MC is rising ? Substantiate your argument.

24. Find out marginal utility from the total utility function

$U = 20x^4 + 7x^3 + 13x^2 + 12x + 9.$

(6 × 3 = 18 marks)

Section C

Answer at least **four** *questions.*
Each question carries 6 *marks.*
All questions can be attended.
Overall Ceiling 24.

25. Determine the equilibrium price and quantity and maximum profit of a monopolist whose demand and cost junctions are :

$P_1 = 80 - 5Q_1, P_2 = 180 - 20Q_2, C = 50 + 20(Q_1 + Q_2).$

26. Derive an input-output technical co-efficient.

27. What are the factors that influence the MPS ?

28. Determine the profit maximizing condition of a multi plant monopolist.

29. Distinguish between homogeneous and homothetic utility functions.

30. Illustrate average revenue and marginal revenue using an example.

31. Discuss the meaning and applications of Lagrange multiplier.

32. Distinguish between increasing and diminishing returns to scale.

(4 × 6 = 24 marks)

Section D

Answer any **two** *questions.*
Each question carries 13 *marks.*

33. Answer the following :

    a) Discuss the mathematical conditions for achieving equilibrium in a perfectly competitive market.

    b) Find the profit maximizing output where $TC = Q^3 - 7Q^2 + 12Q + 5$, price ($p$) is 8.

34. State and prove the properties of Cobb- Douglas production function. Point out its major limitations.

35. Discuss the equilibrium conditions of a discriminating monopolist. Identify the advantages and disadvantages of price discrimination.

36. Explain various methods of measuring price elasticity of demand using numerical examples. Analyze the significance of cross elasticity of demand.

(2 × 13 = 26 marks)

C 80392 (Pages : 4) Name.....

Reg. No.....

SIXTH SEMESTER B.A./B.Sc. DEGREE EXAMINATION, MARCH 2020

(CUCBCSS—UG)

Economics

ECO 6B 12—MATHEMATICAL ECONOMICS

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *questions.*

Each question carries ½ mark.

1. If total revenue, $TR = 100 - 100Q^2$, then what is the marginal revenue ?

   (A) $100Q^2$. (B) $100Q$.

   (C) $200Q$. (D) $200Q^2$.

2. Given the Cobb- Douglas Production function $Q = A K^{\alpha} L^{\beta}$, A refers to :

   (A) Managerial efficiency. (B) Marginal productivity.

   (C) Marginal profit. (D) Marginal revenue.

3. Lagrangian multiplier is a/an :

   (A) OLS method.

   (B) MLP method.

   (C) Constraint optimisation method.

   (D) Unconstraint optimisation method.

4. The marginal revenue curve in monopoly :

   (A) Equals the demand curve.

   (B) Is parallel with the demand curve.

   (C) Lies below and converges with the demand curve.

   (D) Lies below and diverges from the demand curve.

5. The output elasticity of labour measures :

   (A) $(\Delta Q)/(\Delta L)$. (B) $(\% \Delta Q)/(\% \Delta L)$.

   (C) $(\Delta L)/(\Delta Q)$. (D) $(\% \Delta L)/(\Delta L)$.

Turn over

6. In perfect competition, shut down point is the point where :

(A) AR = AC. (B) AC = AVC.

(C) AVC = TC. (D) Price = AVC.

7. All of the solutions possible in the face of existing constraints are called:

(A) Optimal solution. (B) Feasible.

(C) Primal solution. (D) Dual solution.

8. If P = 10, at the point on the demand curve where $e = 0.5$, MR is :

(A) 5. (B) 0.

(C) – 1. (D) – 10.

9. Which of the following is *not* an assumption of linear programming ?

(A) Constant output prices.

(B) Constant input prices.

(C) Increasing returns to scale.

(D) Technologically fixed factor proportions.

10. If the cross elasticity of demand is – 2 :

(A) The products are substitutes and demand is cross price elastic.

(B) The products are substitutes and demand is cross price inelastic.

(C) The products are complements and demand is cross price elastic.

(D) The products are complements and demand is cross price inelastic.

11. Find differential co-efficient of $2X^3 + 3X^2 + 4X + 10$:

(A) $6X^2 + 6X + 4$. (B) $6X + 6X + 4$.

(C) $6X + 3X + 4$. (D) $2X + 3X + 4X + 10$.

12. Empirical demand curves refer to demand curves estimated from :

(A) Actual market price - quantity observations.

(B) Utility theory.

(C) The new approach to consumer theory.

(D) None of these.

(12 × ½ = 6 marks)

Part B

Answer any **ten** *questions.*
Each question carries 2 *marks.*

13. Illustrate the Euler's theorem.
14. What is meant by marginal propensity to save ?
15. What is profit function ?
16. Define elasticity of substitution.
17. What is optimal solution ?
18. What is meant by linear homogeneous production function ?
19. Calculate MPC from the following information :

Income	Consumption
120	120
180	170

20. Distinguish between perfect competition and imperfect competition.
21. Briefly explain the meaning of price discrimination.
22. What do you mean by an input output model ?
23. Explain the primal- dual relationships in the linear programming.
24. Define production possibility curve.

(10 × 2 = 20 marks)

Part C

Answer any **six** *questions.*
Each question carries 5 *marks.*

25. Explain the degree of homogeneity.
26. Explain multivariable functions with suitable example.
27. Find the AP, MP and output elasticity of capital and labour for the production function :

$Q = 10\,K^{0.7}\,L^{0.1}$.

28. Explain the fundamental assumptions of linear programming.

29. Discuss the meaning and significance of Lagrange multiplier.

30. What are the necessary conditions for price discrimination ?

31. Discuss the assumptions of input-output model.

32. Illustrate the relationship between AR and MR with the help of a diagram.

(6 × 5 = 30 marks)

Part D

Answer any **two** *questions.*
Each question carries 12 *marks.*

33. State and illustrate the conditions for the equilibrium of a firm under perfect competition.

34. Prove that Cobb-Douglas production function is a linear homogeneous production function of degree one. Identify and prove its other important properties.

35. Find solution to the linear programming problem using graphical method :

Maximize $Z = X_1 + 1.5X_2$
subject to the constraints

$$2X_1 + 2X_2 \leq 16$$
$$X_1 + 2X_2 \leq 12$$
$$4X_1 + 2X_2 \leq 28$$
$$X_1, X_2 \geq 0.$$

36. Determine the relation between price and elasticity under monopoly market.

(2 × 12 = 24 marks)

C 60214 (Pages : 4) Name.....

Reg. No.....

SIXTH SEMESTER B.A. DEGREE EXAMINATION, MARCH 2019

(CUCBCSS)

Economics

ECO 6B 12—MATHEMATICAL ECONOMICS

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *questions.*
Each question carries ½ mark.

1. A linear function is in the form :

   (a) $y = a + bx$. (b) $y = a + bx + cx^2$.

   (c) $y = ax^n$. (d) $y = a^x$.

2. For the consumption function, $C = 100 + 0.8y$, MPC is :

   (a) 100. (b) $0.8y$.

   (c) 0.8. (d) None of the above.

3. If the total revenue function is given as, $R = 2x^2 - 10x$, MR is :

   (a) $x^2 - 5$. (b) $4x$.

   (c) $4x - 10$. (d) $2x^3 - 10x^2$.

4. If change in price, either rise or fall, is followed by a fall in total outlay, the Elasticity of demand is said to be :

   (a) Less than unity. (b) Greater than unity.

   (c) 1. (d) 0.

5. For the demand function, $D = 100 - 2P$, price elasticity is :

   (a) $\frac{-2P}{100 - 2P}$. (b) $-2P$.

   (c) -2. (d) $\frac{100 - 2P}{2P}$.

Turn over

6. The sufficient condition for maximum is :

(a) $f''(x) > 0$. (b) $f'(x) > 0$.

(c) $f'(x) = 0$. (d) $f''(x) < 0$.

7. Marginal utility for the utility function $U = 20x^4 + 7x^3 + 13x^2 + 12x + 9$ is :

(a) $80x^3 - 7x^2 - 13x$. (b) $80x^3 + 21x^2 + 26x + 12$.

(c) $80x^3 + 12$. (d) $80x^3 + 21x^2 + 13x$.

8. In order to maximize profit, a firm must choose the output level such that its :

(a) MR < MC. (b) MR > MC.

(c) MR = MC. (d) MR ≠ MC.

9. If the production function is a linear homogeneous production function then the elasticity of substitution between capital and labour is :

(a) 0. (b) Greater than one.

(c) Less than one. (d) Equal to one.

10. Linear Programming as an economic tool was first developed and applied by :

(a) Prof. Danzig. (b) Von Neumann.

(c) Morgenstern. (d) Prof. W.W. Leontif.

11. The quantity of the supply of a product at a given price depends upon the nature of its :

(a) AC curve. (b) MC curve.

(c) MR curve. (d) AR curve.

12. Input-Output analysis assumes :

(a) Increasing returns to scale. (b) Diminishing returns to scale.

(c) Constant returns to scale. (d) None of the above.

(12 × ½ = 6 marks)

Part B (Very Short Answer Questions)

Answer any **ten** *questions.*
Each question carries 2 marks.

13. Distinguish between Leontief open and closed input-output model.
14. What is a linear homogeneous function ?
15. What is optimal solution ?
16. Define cross elasticity of demand.
17. Define production possibility curve.
18. For the total utility function $U = 20x^4 + 7x^3 + 13x^2 + 12x + 9$, compute marginal utility.
19. What is an economic model ?
20. Define Marginal propensity to consume.
21. If the price of a commodity is Rs. 5 and MR is Rs. 10, find the elasticity of demand.
22. Define market equilibrium.
23. What is an isoquant ?
24. Compute Average cost for the Total cost $C = 8x^3 + 3x^2 - 6x + 3$.

(10 × 2 = 20 marks)

Part C (Short Essay Questions)

Answer any **six** *questions.*
Each question carries 5 marks.

25. What is meant by input-output analysis ? What are the various uses of input-output analysis ?
26. Explain the concepts of maxima and minima of functions. How are they estimated ?
27. Discuss the conditions for profit maximization under monopoly.
28. For a firm under perfect competition, it is given that $p = 3$ and $c = 100 + .015x^2$. Find how many items are produced to maximize the profit. What is the profit ?
29. Determine Marginal Utilities of x and y at $x = 3$ and $y = 2$ for the Total Utility Function $U = 5x^2 y + 2xy^3 + 3x + 9y$.

Turn over

30. What are the applications of Linear Programming methods ?

31. Calculate marginal productivity of labour and capital from the following production functions

(i) $X = L^2 + 2L + 10$; (ii) $X = K^2 + 3K^3$.

32. Write a note on indifference curve. What are the properties of indifference curve ?

(6 × 5 = 30 marks)

Part D (Essay Questions)

Answer any **two** *questions.*
Each question carries 12 *marks.*

33. Solve the following LPP graphically :

Maximize $Z = 2x_1 + 3x_2$
subject to $x_1 + x_2 \leq 1$
$3x_1 + x_2 \leq 4$
$x_1 \geq 0, x_2 \geq 0.$

34. Given the utility function $U = f(x, y)$, the prices are p_1= Rs. 5 and p_2 = Rs. 5 and consumer's income for the period is Rs. 50. Find out the consumer's equilibrium level of consumption of commodity x and y. Also prove the conditions for maximization.

35. Given the following Revenue (R) and Cost (C) functions for a firm $R = 20q - q^2$ and $C = q^2 + 8q + 2$, find the equilibrium level of output, price, total revenue, total cost and profit.

36. Given the Demand and the Average Cost Functions of a monopolistic firm as $P = 32 - 3q$, $AC = q + 8 + \frac{5}{q}$, what level of output maximizes total profit and what are the corresponding values of R, AR, MR, C, AC, MC and Profit ?

(2 × 12 = 24 marks)

D 41053 (Pages : 4) Name.....

Reg No.....

SIXTH SEMESTER B.A. DEGREE (SUPPLEMENTARY) EXAMINATION MARCH 2018

(CCSS)

EC 6B 11—MATHEMATICAL ECONOMICS

(2013 Admissions)

Time : Three Hours Maximum : 30 Weightage

Part A

Answer **all** *questions.*

1. Which of the following is not the role of an economic model ?

   (a) Prediction. (b) Explanation.

   (c) Interpretation. (d) Measurement.

2. In economic theory it is assumed that utility function is :

   (a) Double valued function. (b) Single valued function.

   (c) Discrete function. (d) Unique function.

3. Which of the following is not a property of theoretical demand function ?

   (a) Continuous.

   (b) Single valued function of prices and income.

   (c) Always convex down.

   (d) Homogeneous of degree zero in prices and income.

4. An inferior good with income effect exceeding substitution effect of a price change belongs to the class of :

   (a) Necessary good. (b) Normal good.

   (c) Luxury good. (d) Giffen good.

5. In an iso-quant it is assumed that :

   (a) Output and inputs are constants.

   (b) Output is constant and inputs variables.

   (c) Output and inputs are variables.

   (d) The above three options are all false.

6. The U-shape of short-run marginal cost curve reflects :

(a) Laws of Returns to scale. (b) Maximum level of output.

(c) Minimum level of cost. (d) Laws of variable proportion.

7. When the marginal products of labour and capital are given at $MP_L = 20$ and $MP_K = 40$ the marginal rate of technical substitution, $\frac{dK}{dL}$ is :

(a) 2. (b) – 0.5.

(c) – 2. (d) 0.5.

8. The locus of output combinations that can be secured from a given level of input is called :

(a) Isoquant. (b) Product transformation curve.

(c) Iso-cost line. (d) Isocline.

9. A linear production activity is characterised by :

(a) Maximum Output.

(b) Fixed proportion for inputs and output levels.

(c) Minimum Cost.

(d) Variable proportion for inputs and output levels.

10. The rising portion of cost curve reflects the operation of :

(a) Constant returns. (b) Increasing returns.

(c) Diminishing returns. (d) None of the above options.

11. The Optimal point in a linear programming problem is point belonging to :

(a) Universal Set. (b) Power Set.

(c) Convex Set. (d) Concave Set.

12. If the total revenue under perfect competition is given by $R = PQ$, the demand curve is :

(a) P. (b) Q.

(c) P/Q. (d) Q/P.

(12 × ¼ = 3 weightage)

Part B (Short Answer type Questions)

Answer **all** *questions.*

13. Define utility function.
14. What is duality in linear programming ?
15. What is marginal rate of substitution ?
16. What do you mean feasible region of production ?
17. Define homogeneous function.
18. What is a point of inflexion ?
19. What is market equilibrium ?
20. Define discriminating monopoly.
21. How to compute consumer's surplus ?

(9 × 1 = 9 weightage)

Part C (Short Essay/Paragraph type Questions)

Answer any five questions out of seven.

22. Show that the slope of a standard indifferent curve is negative.
23. Given the demand function $Q_1 = P_1^{\alpha} P_2^{\beta}$, where P_1 and P_2 are own price and price of related good verify that α and β represent own price and cross price elasticity coefficients.
24. Find the level of maximum output given the production function $Q = xy$ and the cost constraint is $20x + 10y = 200$, by applying the Lagrange multiplier method.
25. Explain the simplex algorithm.
26. When the total revenue under monopoly is given by $R = PQ$, where P and Q are variable price and quantity, verify that the slope of revenue curve is determined by the price and the price elasticity of demand.
27. Establish the relationship between average and marginal costs.
28. Define income effect and substitution effect of a price change and explain how goods are classified using these concepts.

(5 × 2 = 10 weightage)

Part D (Essay Questions)

Answer any **two** *questions out of* **three.**

29. Derive the demand equations for two goods given the utility function, $U = x_1, x_2$ and the budget constraint, $P_1x_1 + P_2x_2 = 100$.

30. The Cobb-Douglas production function is specified as $Q = AK^{\alpha} L^{\beta}$. State and explain any of the five properties.

31. Given the revenue $R = f(Q)$ and cost functions as $C = f(Q)$ derive conditions for maximum profit.

(2 × 4 = 8 weightage)

C 21746 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.A. DEGREE (SUPPLEMENTARY/IMPROVEMENT) EXAMINATION, MARCH 2017

(UG–CCSS)

Economics

EC 6B 11—MATHEMATICAL ECONOMICS

(2013 Admissions)

Time : Three Hours Maximum : 30 Weightage

Part A

Answer **all** *questions.*
Each question carries ¼ weightage.

1. If the percentage increase in the quantity of a commodity demanded is smaller than the percentage fall in its price, the coefficient of price elasticity of demand is :
   (a) Greater than one. (b) Equal to one.
   (c) Smaller than one. (d) Zero.
2. Empirical demand curves refers to demand curves estimated from :
   (a) Utility theory.
   (b) The new approach to consumer theory.
   (c) Actual market price quantity observations.
   (d) None of these.
3. In a Linear programming problem, a feasible set of solution is one which satisfy :
   (a) Constraints. (b) Objective function.
   (c) Both of the Above. (d) Any of the above.
4. If the $MRTS_{LK}$ equals 2, then the MP_K / MP_L is :
   (a) 2. (b) 1.
   (c) ½. (d) 4.
5. Given the Cobb-Douglas Production function $Q = A K^{\alpha} L^{\beta}$, A refers to :
   (a) Managerial efficiency. (b) Marginal Productivity.
   (c) Marginal profit. (d) Marginal revenue.
6. The output elasticity of labour measures :
   (a) $(\Delta Q)/(\Delta L)$. (b) $(\%\Delta Q)/(\%\Delta L)$.
   (c) $(\Delta L)/(\Delta Q)$. (d) $(\%\Delta L)/(\Delta L)$.

Turn over

7. If P = 10, at the point on the demand curve where $e = 0.5$, MR is :

   (a) 5. (b) 0.

   (c) – 1. (d) – 10.

8. When the Marginal cost is less than average cost, the average cost is :

   (a) Rises. (b) Falls.

   (c) Constant. (d) None of these.

9. When the perfectly competitive firm but not the industry is in long run equilibrium :

   (a) P = MR = SMC = SAC.

   (b) P = MR = LMC = LAC.

   (c) P = MR = SMC = LMC ≠ SAC = LAC.

   (d) P = MR = SMC = LMC ≠ SAC = lowest point on the LAC.

10. When the demand curve is elastic, MR is :

    (a) 1. (b) 0.

    (c) Positive. (d) Negative.

11. At the point of Consumer equilibrium :

    (a) The Indifference curve is tangent to the Budget line.

    (b) The MRS_{XY} equals P_X / P_Y.

    (c) $MU_X/P_X = MU_Y/P_Y$.

    (d) All the above.

12. When the Total Product reached at its maximum, Marginal product is :

    (a) Zero. (b) Negative.

    (c) Positive. (d) One.

(12 × ¼ = 3 weightage)

Part B (Short Answer Type Questions)

Answer **all** *questions.*
Each question carries 1 *weightage.*

13. Define MRS_{xy}.
14. What is Price Discrimination ?
15. Mention two properties of Isoquant.
16. Define Elasticity of Substitution.
17. Shadow Price.
18. Cross elasticity of Demand.
19. State mathematically Engel's law.
20. Fixed coefficient Production function.
21. What is Dual Problem ?

(9 × 1 = 9 weightage)

Part C (Short Essay Questions)

Answer any **five** *questions.*
Each question carries 2 weightage.

22. A Monopolist uses an input X which he purchases at Rs. 5 to produce output Q. His Demand and Production function are $P = 85 - 3Q$, $Q = \sqrt[2]{X}$ respectively. Determine the value of P, Q and X at which monopolist maximizes the profit.

23. Find the AP, MP and output elasticity of capital and labour for the production function $Q = 10\ K^{0.7}L^{0.1}$.

24. Show the first and second order condition for consumer equilibrium for a given utility Function $U = f(Q_1, Q_2)$ and the budget constraint $M = P_1Q_1 + P_2Q_2$.

25. Establish the relationship between Average product and Marginal product.

26. Explain the Euler's Theorem.

27. Explain constrained output maximization for a give production function $Q = f(X_1, X_2)$. Subject to cost constraint $C = r_1X_1 + r_2X_2 + b$.

28. Elucidate the features of Perfect Competition.

(5 × 2 = 10 weightage)

Part D (Essay Questions)

Answer any **two** *questions.*
Each question carries 4 weightage.

29. Examine the properties of Cobb- Douglas Production Function.

30. Find the optimal solution for a given linear programming problem by using Simplex method :

Maximize Profit $Z = 2.5\ X_1 + 2X_2$

Subject to the Constraint

$$X_1 + 2X_2 \leq 8000$$
$$3X_1 + 2X_2 \leq 9000$$

31. Explain equilibrium price and output of a firm under Monopoly in the Short and long run.

(2 × 4 = 8 weightage)

C 21240 (Pages : 4) Name.....

Reg. No.....

SIXTH SEMESTER B.A. DEGREE EXAMINATION, MARCH 2017

(CUCBCSS—UG)

Economics

ECO 6B 12—MATHEMATICAL ECONOMICS

Time : Three Hours Maximum : 80 Marks

Answers may be written **either** *in English* **or** *in Malayalam.*

Part A

Answer **all** *questions.*
Each question carries ½ mark.

1. Objective of linear programming for an objective function is to :
   (a) Maximize or minimize.
   (b) Subset or proper set modeling.
   (c) Row or column modeling.
   (d) Adjacent modeling.
2. If the order of matrix A is $m \times p$. And the order of B is $p \times n$. Then the order of AB is ?
   (a) $n \times p$.
   (b) $m \times p$.
   (c) $m \times n$.
   (d) $n \times m$.
3. When marginal costs are below average total costs ?
   (a) Average fixed costs are rising.
   (b) Average total costs are rising.
   (c) Average total costs are falling.
   (d) Average total costs are minimized.
4. $(AB)^t = ?$
   (a) B^tA^t.
   (b) A^tB^t.
   (c) AB.
   (d) BA.
5. Suppose the price of a product increases from Rs. 12 to Rs. 20 and the quantity demanded falls from 55 a week to 45, What is the Price Elasticity of Demand ?
   (a) 0.4.
   (b) – 0.4.
   (c) 2.5.
   (d) – 2.5.

Turn over

6. In the short-run, which of the following always gets smaller as output increases ?

   (a) Average fixed cost. (b) Average variable cost.

   (c) Short-run average cost. (d) Short-run marginal cost.

7. In matrices, inter-industry demand is summarized as :

   (a) Input-output matrix. (b) Output-input matrix.

   (c) Linear buying matrix. (d) Linear selling matrix.

8. According to determinant properties, multiple of one row is added to another row then determinant :

   (a) Changed. (b) Unchanged.

   (c) Multiplied. (d) Added.

9. Suppose a demand curve runs from the price axis to the quantity axis in a straight line. Where abouts will Price Elasticity of Demand = – 1.0 ?

   (a) Where the curve meets the price axis.

   (b) Everywhere along the curve.

   (c) At the mid-point of the curve.

   (d) Nowhere along the curve.

10. An isoquant that is :

   (a) Further from the origin represents greater output.

   (b) Flatter represents the trade-offs between inputs that are poor substitutes.

   (c) Negatively sloped represents input combinations associated with Stage I of production.

   (d) All of the above are correct.

11. The law of diminishing returns begins at the level of output where ?

   (a) Marginal cost is at a minimum.

   (b) Average variable cost is at a minimum.

   (c) Average fixed cost is at a maximum.

   (d) None of the above is correct.

12. Two matrices A and B are equal if :

   (a) Both are rectangular.

   (b) Both have same order.

   (c) No. of columns of A is equal to columns of B.

   (d) Both have same order and equal corresponding elements.

(12 × ½ = 6 marks)

Part B (Very Short Answer Questions)

Answer any **ten** *questions.*
Each question carries 2 *marks.*

13. Define Production possibility curve.
14. Define Mathematical Economics.
15. Define linear programming problem.
16. Define feasible solution.
17. Define Demand function.
18. Explain production function.
19. Define Marginal Revenue.
20. Define Leontief matrix.
21. Define Investment function.
22. Define Input-output model.
23. Define return to acale.
24. Define isocost line.

(10 × 2 = 20 marks)

Part C (Short Essay Questions)

Answer any **six** *questions.*
Each question carries 5 *marks.*

25. If $D = 40 - 5p$ and $S = 30 - p$ are the demand and supply functions in a market show that a specific tax of Re. 1 per unit will cause a decline in the market price.
26. Explain the conditions for maxima and minima.
27. Explain market equilibrium.
28. Explain the relationship between MC and AC.
29. If AR = 6, MR = 4 find price elasticity of demand.
30. Given the line $2x + 3y = 20$, find the slope and Y intercept.
31. Write a note on LPP.
32. Explain the importance of mathematical economics.

(6 × 5 = 30 marks)

Part D (Essay Questions)

Answer any **two** *questions.*
Each question carries 12 *marks.*

33. If D = 150 – 5P and S = 200 – 10P are the demand and supply function of a market equilibrium price and quantity. Show that the system is stable according to Marshall and unstable according to Walras.

34. Maximise (Graphically) $Z = 15X_1 + 16X_2$.

subject to

$$4X_1 + 6X_2 \leq 360$$

$$3X_1 + 0X_2 \leq 180$$

$$0X_1 + 5X_2 \leq 200$$

$$X_1, X_1 \geq 0$$

35. Two industries I and II input-output relations are given below in A with final demand vector B (in units) :

$$A = \begin{array}{c|cc} & \text{I} & \text{II} \\ \text{I} & 50 & 75 \\ \text{II} & 100 & 50 \end{array} \qquad B = \begin{array}{c|c} & \\ \text{I} & 75 \\ \text{II} & 50 \end{array}$$

If the gross output increases to $\begin{array}{c|c} \text{I} & 400 \\ \text{II} & 600 \end{array}$, determine the final demand which can be satisfied.

36. A monopolist is facing a linear demand, $p = 100 - 4q$. His linear cost function is given by $C = 50 + 20q$. Calculate the equilibrium price, quantity and the maximum profit.

(2 × 12 = 24 marks)

D 40200 (Pages : 4) Name.....

Reg. No.....

SIXTH SEMESTER B.A. DEGREE EXAMINATION, MARCH/APRIL 2018

(CUCBCSS—UG)

Economics

ECO 6B 12—MATHEMATICAL ECONOMICS

Time : Three Hours Maximum : 80 Marks

Answers may be written **either** *in English* **or** *in Malayalam.*

Part A

Answer **all** *questions.*
Each question carries ½ mark.

1. Linear programming used to optimize mathematical procedure and is :
   (a) Subset of mathematical programming.
   (b) Dimension of mathematical programming.
   (c) Linear mathematical programming.
   (d) All of above.

2. If $\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix}$ $A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$

   then order of matrix A = ?
   (a) 2×2. (b) 2×3.
   (c) 3×2. (d) 3×3.

3. Which of the following statements is false ?
   (a) Price elasticity of demand is negative for most products.
   (b) Price elasticity of supply is positive for most products.
   (c) Income elasticity of demand is positive for normal goods.
   (d) Cross elasticity of demand is positive between complements.

4. The "law of demand" states that, other things remaining the same, the quantity demanded of any good is :
   (a) Inversely related to its price. (b) Directly related to its price.
   (c) Positively related to its price. (d) Directly related to the supply of the good.

Turn over

5. Example of linear equation involving two variables is

(a) $7x + 3y + 4z = 20$. (b) $6x + 2y = 10$.

(c) $8x = 2 + 10$. (d) $7a + 8b + 9c = 10 + 5$.

6. In linear equation '$ax + by = c$' a, b and c are considered as :

(a) Variable. (d) Constants.

(c) Zero. (d) Real numbers.

7. Which of the following short-run cost curves declines continuously ?

(a) Average total cost. (b) Marginal cost.

(c) Average fixed cost. (d) Average variable cost.

8. The market demand curve for a perfectly competitive industry is QD = 12 – 2P. The market supply curve is QS = 3 + P. The market will be in equilibrium if :

(a) P = 6 and Q = 9. (b) P = 5 and Q = 2.

(c) P = 4 and Q = 4. (d) P = 3 and Q = 6.

9. The demand curve faced by a monopolistically competitive firm is

(a) Perfectly elastic. (b) Elastic.

(c) Unit elastic. (d) Inelastic.

10. Which of the following is not a type of market structure ?

(a) Competitive monopoly.

(b) Oligopoly.

(c) Perfect competition.

(d) All of the above are types of market structures.

11. If AB exists, then $(AB)^{-1}$ is :

(a) $A^{-1} B^{-1}$. (b) $B^{-1} A^{-1}$.

(c) AB. (d) None of Above.

12. Two matrices A and B are added if :

(a) Both are rectangular.

(b) Both have same order.

(c) No of columns of A is equal to columns of B.

(d) No of rows of A is equal to no of columns of B.

(12 × ½ = 6 marks)

Part B (Very Short Answer Questions)

Answer any **ten** *questions.*
Each question carries 2 *marks.*

13. Find the slope of the curve $2x = -4y + 6$.
14. Define Consumption function.
15. If C = 200 + 0.5 Y, I = 200. Find the equilibrium level of income.
16. Define Income elasticity.
17. Explain the properties of Cobb Douglas production function.
18. Explain the relationship between Average and marginal cost.
19. Find the slope and intercept on Y axis of the straight line $2y - 4x + 16 = 0$.
20. Explain the conditions for Maximization.
21. Given the AR= $100 - 2q$ obtain MR when $q = 5$.
22. Write a note on input output analysis.
23. Write a note on production possibility curve.
24. Explain market equilibrium.

(10 × 2 = 20 marks)

Part C (Short Essay Questions)

Answer any **six** *questions.*
Each question carries 5 *marks.*

25. Write a note on Homogeneous production function.
26. Write a note on Price, income and cross elasticities of demand.
27. Explain the necessary and sufficient conditions for equilibrium of a firm under perfect competition.
28. Write a note on Linear programming problem.
29. Find the optimum commodity purchase for a consumer whose utility function $U = 10\, q_1 q_2$. Budget equation of the consumer is $100 = 50q_1 + 10q_2$.
30. If $D = -50p + 250$ and $S = 25p + 25$ are the demand and the supply functions of a certain product. Plot both the curves and obtain the equilibrium price and the quantity

31. Explain the importance of mathematical representation of economic models.

32. The lond run cost function of a firm is $C = q^3 - 8q^2 + 20q$. Prove that MC = AC at the minimum point of AC.

(6 × 5 = 30 marks)

Part D (Essay Questions)

Answer any **two** *questions.*
Each question carries 12 *marks.*

33. Given the demand function $Qd = 100 - 3P$ and the supply is $Qs = 200 - 8P$.

    (i) Find the equilibrium price and quantity.

    (ii) Find the price and quantity sold if a tax of 2.5 Rs per unit is imposed.

    (iii) If a specific subsidy of Rs 2.5 per unit is given, calculate new equilibrium values.

    (iv) What will be the total revenue of the government ?

34. The utility function of the consumer is given by $u = X_1 X_2^2 - 10X_1$ where X_1 and X_2 are the quantities of two commodities consumed. Find the optimal utility value if his income is 116 and product prices are 2 and 8 respectively.

35. Solve the following LPP graphically.

    Maximize $Z = 3x_1 + 4x_2$
    subejct to the costraints
    $4x_1 + 2x_2 \leq 80$
    $2x_1 + 5x_2 \leq 180$
    $x_1, x_2 \geq 0$.

36. Given the demand curve of the monopolist $P = 100 - 4q$. His cost function is $TC = 50 + 20\,q$. Find the profit of the firm at this level of output.

(2 × 12 = 24 marks)