



LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

U.G. DEGREE EXAMINATION – ALLIED

FOURTH SEMESTER – APRIL 2025

UMT 4401 – MATHEMATICS FOR COMMERCE



Date: 06-05-2025

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

SECTION A - K1 (CO1)

Answer ALL the Questions

(10 x 1 = 10)

1. **Answer the following**

- a) Define nominal rate of interest.
- b) Write the truth table for biconditional operator.
- c) Examine the equilibrium price by the method of excess demand for the given functions:

$$Q_d = 50 - \frac{8p}{7} ; Q_s = 10 + \frac{2p}{3}.$$
- d) Define the definite integral of $f(x)$ over the interval $[a, b]$.
- e) State any two basic properties of Boolean algebra.

2. **Fill in the blanks**

- a) The process of calculating the present value of a future amount of money is called _____.
- b) The converse of the implication $P \rightarrow Q$ is _____.
- c) _____ of demand measures the responsiveness of quantity demanded to changes in price.
- d) Definite integrals are used to calculate the _____ of a function over a given interval.
- e) In Boolean algebra, the canonical form is a standard way of writing a Boolean expression using only _____ and _____.

SECTION A - K2 (CO1)

Answer ALL the Questions

(10 x 1 = 10)

3. **Choose the correct answer for the following**

- a) Which of the following represents the relationship between nominal and effective interest rates when compounded more than once a year?
 - (i) Effective rate is always higher than nominal rate.
 - (ii) Effective rate is always lower than nominal rate.
 - (iii) Nominal rate and effective rate are always the same.
 - (iv) Nominal rate is irrelevant when compounding is continuous.
- b) A compound proposition that is always true is called
 - (i) contradiction
 - (ii) tautology
 - (iii) conjunction
 - (iv) disjunction
- c) Which of the following defines equilibrium in the context of supply and demand?
 - (i) Supply exceeds demand
 - (ii) Demand exceeds supply
 - (iii) Supply equals demand
 - (iv) Supply and demand are unrelated
- d) What does the consumers' surplus represent?
 - (i) The difference between the total cost and the total revenue
 - (ii) The area under the supply curve
 - (iii) The difference between what consumers is willing to pay and what they actually pay
 - (iv) The marginal revenue of a firm

e)	In Boolean algebra, $(a + b)' = a' \cdot b'$ is (i) commutative law (ii) distributive law (iii) associative law (iv) De Morgan's law
4.	State True or False
a)	If interest is compounded annually, the nominal rate of interest and the effective rate of interest are the same.
b)	The contrapositive of a statement is always logically equivalent to the original statement.
c)	The average cost curve always lies above the marginal cost curve.
d)	Definite integration can be used to calculate both consumers' and producers' surplus in economics.
e)	The dual of a Boolean expression is obtained by swapping AND and OR operators and negating the expression.
SECTION B - K3 (CO2)	
	Answer any TWO of the following (2 x 10 = 20)
5.	A sum of Rs.1000 is invested for 5 years at 12% interest per year. What is the simple interest? If the same amount had been invested for the same period at 10% per annum compound interest compounded per year, how much more interest would be got?
6.	A demand function is given by $p = \sqrt{100 - x^2}$ and the supply function is given by $x = 2p - 10$, where p is price and x is quantity. Calculate elasticities of demand and supply at equilibrium price.
7.	Let p be the statement "He is rich" and q be the statement "He is happy". Give a simple verbal sentence which describes each of the following. (i) $p \wedge q$ (ii) $p \wedge \neg q$ (iii) $\neg(\neg p \vee q)$ (iv) $\neg p \wedge \neg q$ (v) $p \vee (\neg p \wedge q)$
8.	Demand and supply functions are $D(x) = (12 - 2x)^2$ and $S(x) = 56 + 4x$ respectively. Determine consumer surplus under monopoly (to maximize the profit), given that the supply function is identified with the marginal cost function.
SECTION C - K4 (CO3)	
	Answer any TWO of the following (2 x 10 = 20)
9.	Test the following statements are true or not. (i) $\neg(P \vee Q) \equiv \neg P \wedge \neg Q$ (ii) $\neg(P \wedge Q) \equiv \neg P \vee \neg Q$ (5+5)
10.	If the marginal revenue function for output is given by $R_n = \frac{6}{(x+2)^2} + 5$, determine the total revenue function by integration. Also deduce the demand function.
11.	In Boolean algebra, let $x, y \in B$. Defend that (i) $x \cup (x \cap y) = x$ (ii) $x \cap (x \cup y) = x$ (5+5)
12.	Evaluate $\int \frac{x}{(x-1)(2x+1)} dx$ using partial fraction method.
SECTION D - K5 (CO4)	
	Answer any ONE of the following (1 x 20 = 20)
13.	(a) A machine costing Rs 80,000 would reduce to Rs 20,000 in 8 years. Determine the rate of yearly depreciation, given that depreciation is calculated using diminishing balances method. (b) Determine the value of Boolean function $(x \cap y) \cup [(x \cup y') \cap y]'$ using the truth table.

14. The total cost function of a firm is given by

$$C = 0.04q^3 - 0.9q^2 + 10q + 10$$

Determine the following.

- (i) Average cost
- (ii) Marginal cost
- (iii) Slope of average cost
- (iv) Slope of marginal cost
- (v) Value of q at which average variable cost is minimum.

SECTION E – K6 (CO5)

Answer any ONE of the following

(1 x 20 = 20)

15. (a) Let the cost function of a firm be given by the following equation:

$$C = 300x - 10x^2 + \frac{1}{3}x^3$$
, where C stands for cost and x for output. Estimate

- (i) the output at which marginal cost is minimum.
- (ii) the output at which average cost is minimum.
- (iii) the output at which average cost is equal to marginal cost.

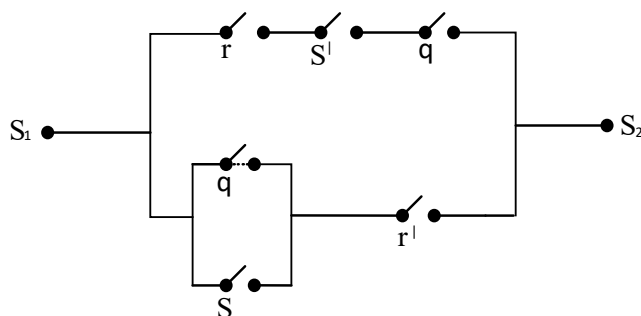
(b) Reframe the following statements with its converse, inverse and contrapositive:

(i) If x and y are numbers such that $x = y$ then $x^2 = y^2$.

(ii) If a quadrilateral is a square then it is a rectangle.

(15+5)

16. Indicate the network and construct the truth table for the network, simplify and give a simpler network.



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