2021

(July)

ECONOMICS

(Honours)

(Mathematics for Economist)

Marks: 75

Time: 3 hours

The figures in the margin indicate full marks for the questions

Answer five questions, selecting one from each Unit

Unit—I

- **1.** (*a*) Define set. Explain different operations of sets with examples. 2+3=5
 - (b) Given the sets

Prove the De Morgan's law for union and intersection.

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(2)

- (c) In a class of 25 students of economics and politics, 12 students have taken economics. Out of these 8 have taken economics but not politics. Find the number of students who have taken economics and politics and those who have taken politics but not economics. 3+3=6
- **2.** (a) Differentiate any *three* of the following with suitable examples : 3×3=9
 - (i) Linear and quadratic functions
 - *(ii)* Homogeneous and homothetic functions
 - (iii) Explicit and implicit functions
 - (iv) Domain and range of a function
 - (b) Find the equation of the straight line passing through the points (3, -2) and (-4, 1). Also write down the gradient of the line.

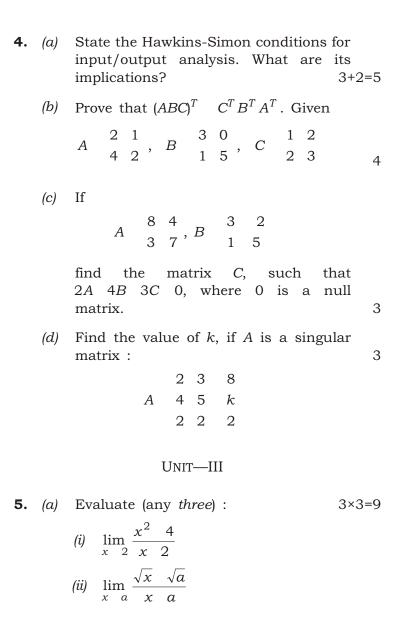
Unit—II

- **3.** (a) What is matrix? Mention some of its properties. 1+5=6
 - (b) Solve the given simultaneous equationsby matrix inversion method : 9

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(Continued)

(3)



(iii)
$$\lim_{x} \frac{5x^3}{3x^3} \frac{2}{x-1}$$

(iv) $\lim_{x \to 2} \frac{x^2}{x^2} \frac{6x}{7x-10}$
(v) $\lim_{x \to 0} \frac{\sqrt{1-x}}{x} \frac{\sqrt{1-x}}{x}$

What makes a function continuous? (b)Given the function

х

f(x) = 3 - 2x for 3/2 - x = 0 $3 \ 2x \ \text{for} \ 0 \ x \ 3/2$ 3 2x for $x \ 3/2$

Is the function continuous at x = 0? 2+4=6

6. (a) Differentiate any four of the following functions : 2×4=8 (i) $y (2x 5)(x^2 x 1)$

(*ii*) $y (2x^2 7)^{10}$ (iii) $y \sqrt{x^2 5x}$ (iv) $y = \frac{x^2 - 7}{x^2 - 7}$ $(v) x^3 3xy 5y 6 0$ (vi) $y x^x$

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(b) Find the first- and second-order partial derivatives of the following function :

$$z \quad 2x^3 \quad 5x^2y \quad xy^2 \quad y^2$$

Verify that

$$\frac{\frac{2}{x}}{x} \frac{\frac{2}{y}}{y} \frac{\frac{2}{x}}{x}$$

(c)
$$u (3x^2 5y^2)^5$$
. Find du . 3

UNIT—IV

- 7. (a) State the necessary and sufficient conditions for maximum and minimum values, and hence find the maximum and minimum values of the function $y \frac{1}{3}x^3 \ 3x^2 \ 8x \ 10.$ 2+4=6
 - (b) The demand equation for a manufacturer is given by P 500 2q, and his average cost function is 0 25q 4 $\frac{400}{q}$, where q is output and
 - p is price. Determine—
 - *(i)* the level of output at which profit is maximized;
 - (ii) the price at which this occurs;
 - (iii) the maximum profit. 4+3+2=9

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(Turn Over)

(6)

8. (a) The total cost associated with producing and marketing x units of an item is given by
C 0 005x³ 0 02x² 30x 3000
Find AC at 10 units of output and MC at 3 units of output. 3+3=6
(b) The demand function is given by q 20/p 3. Calculate price elasticity of demand at price p 2 and also interpret the result. 7+2=9

Unit—V

- **9.** (*a*) What is integration? Why is there a constant of integration? 1+2=3
 - (b) Find the integral of the following (any *four*) : 3×4=12

(i)
$$4x^3 \quad \frac{1}{\sqrt{x}} \quad 3 \quad dx$$

(*ii*) $4(e^{2x} x)(e^{2x} x^2)^2 dx$

(iii)
$$\frac{8x}{(2x^2 \ 1)}dx$$

- (iv) $x^2 e^x dx$
- (v) $x \log x \, dx$
- (vi) $10^{x} dx$

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(Continued)

(7)

10. (a) Evaluate :

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 $\frac{4}{2}3x^{2}(x^{2} \quad 1)dx$

- (b) What is producer's surplus? If the production function is given by $Q = \sqrt{4 + 4p}$ and the market price is 10, find the producer's surplus. 2+4=6
- (c) The demand and supply functions are P_d (6 q)² and P_s 14 q respectively. Find the consumer's surplus under perfect competition. 6

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