

2/H-76 (v) (a) (Syllabus-2015)

2 0 1 7

(April)

COMMERCE

(Honours)

(Fundamental Mathematics)

(BC-202)

Marks : 75

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

Answer any **five** questions

1. (a) Express $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ as the sum of a symmetric matrix and a skew-symmetric matrix. 5

- (b) Compute the inverse of

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix} \quad \text{5}$$

- (c) Solve the following equations by Cramer's rule : 5

$$4x - y - z = 1$$

$$x + y - 2z = 1$$

$$3x + 2y + z = 8$$

2. (a) Find the domain and the range of the following functions : 3+3

(i) $\frac{1}{\sqrt{x-3}}$

(ii) $\frac{x}{|x|}$

- (b) A vegetable seller charges ₹ 25 per papaya for purchase of 6 or less papayas and charges ₹ 20 per papaya if the purchase is more than 6 or less than 11 papayas. If the purchase is more than 11 or equal to 11, he charges ₹ 10 per papaya. Find the cost function $C(x)$ where $C(x)$ represents cost of buying x papayas. 4

- (c) If $f(x) = ax + b$ such that $f(-1) = 5$ and $f(1) = 6$, find $f(x)$. Also find the value of $f(10)$. 3+2

3. (a) Evaluate the following limits : 3+4

(i) $\lim_{x \rightarrow 1} \frac{x^2 - 3x + 2}{x^2 - 4x + 3}$

(ii) $\lim_{x \rightarrow 0} \frac{\sqrt{1+2x} - \sqrt{1-3x}}{x}$

- (b) A function $f(x)$ is defined by

$$f(x) = \begin{cases} -x, & \text{when } x \leq 0 \\ x, & \text{when } 0 < x < 1 \\ 2-x, & \text{when } x \geq 1 \end{cases}$$

Show that $f(x)$ is continuous at $x=0$ and $x=1$. 5

- (c) Draw the graph of the following function : 3

$$f(x) = \begin{cases} -3x, & \text{when } x < 0 \\ x, & \text{when } 0 \leq x \leq 2 \\ 2, & \text{when } 2 < x \leq 4 \end{cases}$$

4. (a) Find the first-order derivative of the following functions (any two) : 4×2=8

(i) $f(x) = \frac{e^x \log_e x}{x^2}$

(ii) $f(x) = x^x$

(iii) $f(x) = \sqrt{2 + \sqrt{2 + x}}$

- (b) Find the elasticities of demand and supply at equilibrium price for the demand function $p = 16 - x^2$ and supply function $p = 2x^2 + 4$, where p is price per unit output and x is the output. 7

5. (a) A firm has total revenue function $R(x) = 100x - x^2$ and total cost function $C(x) = x^3 - \frac{57}{2}x^2$, where x is the level of output. Determine the maximum profit. 5

(4)

- (b) A central agency needs to determine the rent to charge for each of the 200 apartments in order to attain maximum income. Experience shows that if the rent is set at ₹ 150 a week, all units are occupied but for each ₹ 5 per week increase in rent, 5 units become vacant. What rent should be fixed to maximize revenue? Determine also the maximum revenue. 6
- (c) The side of an equilateral triangle is 5 cm and is increasing at the rate of $\sqrt{3}$ cm/sec. How fast is—
(i) the area increasing;
(ii) the perimeter increasing?
(Given $A = \frac{\sqrt{3}}{4} a^2$, where a = side and A = area) 4
6. (a) A company expects cash inflows from its investment proposal, it has undertaken in time period zero, ₹ 2,00,000 in the first year and ₹ 1,50,000 in the second year and expects ₹ 1,00,000 for the next eight years. What would be the present value of cash inflows, assuming a 20% rate of interest? 7

(5)

- (b) If your expected rate of return on investment is 12% per annum and you find a 10% debenture in the market at ₹ 850, would you buy the debenture? Given that the maturity period of the debenture left is 4 years and the maturity value is ₹ 1,000. 8
7. (a) A bond is available for ₹ 1,500 it offers, including one immediate payment and 10 annual payments of ₹ 200. Find the rate of return on the bond. 4
- (b) The annual increase of population of a village is 3% approximately. The population of the city was 30 lakhs at the end of 2015. What will be the population at the end of 2030? 4
- (c) A machine costs ₹ 5,00,000 with a working life of 5 years and a scrap value of ₹ 1,00,000 at the end. Calculate the yearly depreciation as per written down value method and straight-line method if the rate of depreciation is 10%. 7
