

## B. Sc. DEGREE (C.B.C.S.) EXAMINATION, NOVEMBER 2022

(2022 Admissions (regular) 2021 Admissions (Improvement / Supplementary), 2020, 2019, 2018, Admissions  
Supplementary)

## SEMESTER I - COMPLEMENTARY COURSE 1 (MATHEMATICS) (For ECONOMICS)

## MT1C02B18 - GRAPHING FUNCTIONS, EQUATIONS AND FUNDAMENTAL CALCULUS

Time : 3 Hours

Maximum Marks : 80

## Part A

I. Answer any Ten questions. Each question carries 2 marks

(10x2=20)

1. Find the slope of the line passing through the points (8,6), (12,16)
2. Find the slope of the line passing through the points  $(5, -7)$  and  $(12, -8)$ .
3. Find the  $x$  and  $y$  intercepts of  $y = -x + 6$ .
4. Which of the following equations are functions and why? (a)  $y = 2x$  (b)  $y = 3x - 1$
5. A potter exhibiting at a fair receives \$24 for each ceramic sold minus a flat exhibition fee of \$85. Express the revenue  $R$  he receives as a function of the number  $x$  of ceramics sold.
6. A plumber charges \$50 for a house visit plus \$35 an hour for each extra hour of work. Express the cost  $C$  of a plumber as a function of the number of hours  $x$  the job involves.
7. Evaluate  $\lim_{x \rightarrow 6} \frac{x^2 - 11x + 30}{x - 6}$
8. Determine whether the function  $f(x) = 5x^2 - 12x + 8$  is increasing or decreasing at  $x = 4$
9. Compute the third derivative of  $f(x) = 39x^2 - 19x + 26$
10. Evaluate  $\int (35x^4 - 8x^3) dx$
11. Evaluate  $\int_8^{12} 20(x - 7)^3 dx$ .
12. Evaluate

i.  $\int \frac{2}{x^3} dx$

ii.  $\int 5x^4 - 3x^3 dx$

## Part B

II. Answer any Six questions. Each question carries 5 marks

(6x5=30)

13. Calculate the marginal revenue function associated with the demand function  $P = -4Q + 875$  at  $Q = 1$
14. (a) Find the equation for the line passing through the points (3,13) and (7,45) (b) Using the point-slope formula derive the equation of the line passing through the point (3,11) and having the slope -4 .
15. Compute the break-even point for the firm operating in a purely competitive market, given total revenue  $R(x) = -4x^2 + 72x$  and total cost  $C(x) = 16x + 180$ .

16. Compute the equilibrium level of income given  $Y = C + I + G$ ,  $C = 320 + 0.65Y$ ,  $I = 65 + 0.25Y$  and  $G = 150$ .
17. Calculate the marginal and average functions at  $Q = 1$  for the total function  $TC = 7Q^3 - 8Q^2 + 3Q - 6$ .
18. Check whether the function  $f(x) = (4 - 5x)(x - 3)$  is increasing at  $x = 0$ .
19. Evaluate the area between the curves  $y_1 = -3x^2 + 24x - 2$  and  $y_2 = -17x + 68$  from  $x = 0$  to  $x = 4$ .
20. Evaluate  $\int 56x(x + 11)^6 dx$ .
21. A manufacturer's marginal profit is  $\pi' = -3x^2 + 80x + 140$ . Find the additional profit  $\pi$  earned by increasing production from 2 units to 4 units.

### Part C

III. Answer any Two questions. Each question carries 15 marks

(2x15=30)

- 22.
1. (a) Factorise  $11x^2 + 12x - 20$
  - (b) Determine the equation for the line passing through  $(6,4)$  and perpendicular to the line having the equation  $y = 2x + 5$ .
  - (c) Find the profit level of a firm in pure competition that has a fixed cost of Rs. 950, a variable cost of Rs.70 and a selling price of Rs. 85 when it sells (i) 50 units and (ii) 80 units
23. Using graphs, with P on the vertical axis as in economics, find the equilibrium quantity and price of the market with supply and demand equations are given by Supply:  $P = 0.25Q + 2$  Demand:  $P = -0.75Q + 22$
24. Optimize the function  $y = x^4 + 36x^3 + 280x^2 - 79$  and test the second-order conditions at the critical points to distinguish between a relative maximum and a relative minimum.
25. (a) A firm's marginal cost function is  $MC = x^2 - 6x + 125$ , where  $x$  is the number of units produced. Fixed costs are Rs. 280. Find the total cost TC of producing  $x$  units.
- (b) Solve  $\int 24x^2 e^{6x} dx$  using integration by parts.
  - (c) Solve  $\int \frac{15x^4}{\sqrt{6x^5 - 34}} dx$