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Reg. No.....

Name.....

B.A. DEGREE (C.B.C.S.S.) EXAMINATION, SEPTEMBER 2024

First Semester

Complementary Course

GRAPHING FUNCTIONS, EQUATIONS AND LINEAR ALGEBRA

(Complementary Mathematics for B.A. Economics)

[2013—2016 Admissions]

Time : Three Hours

Maximum Marks : 80

Part A

Answer all questions.

Each question carries 1 mark.

1. What is the equation of a line with slope 3 and y intercept 2 ?
2. Given $f(x) = x^2 - 2x + 2$, what is $f(z)$ and $f(-1)$?
3. Is the equation $y^2 = 4x$ represents a function.
4. Given $f(x) = 2x + 5$, $g(x) = x - 2$, find $(f + g)(x)$ and $(f - g)(x)$.
5. Solve the equation $2x - 1 = x + 5$.
6. Find $3 \begin{bmatrix} -1 & 2 \\ 4 & 1 \end{bmatrix}$.
7. Is matrix multiplication commutative.
8. Find the determinant of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix}$.

Turn over





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9. Find $2A - 3B$ where :

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & 1 \\ -1 & 3 \end{bmatrix}.$$

10. What is an optimum solution of a L.P.P ?

(10 × 1 = 10)

Part B

*Answer any **eight** questions.*

Each question carries 2 marks.

11. Solve the equation $\frac{5}{x} + \frac{3}{x+4} = \frac{7}{x}$ $x \neq 0, -4$.

12. Given $f(x) = 2x^3 - 5x^2 + 8x - 10$, find $f(3)$ and $f(-2)$.

13. Find the slope and intercepts of $3y + 15x = 30$.

14. Draw the graph of $y = 2x - 1$.

15. Solve the equation $x^2 - 2x - 3 = 0$.

16. Find the equilibrium price and quantity for the following market :

$$Q_s = -45 + 8p$$

$$Q_d = 125 - 2p$$

17. Given $A = \begin{bmatrix} 1 & 2 \\ -1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$, and $C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, show that $(A + B) + C = A + (B + C)$.





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18. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 5 \\ 0 & 0 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, what are AI and IA ?
19. If $A = \begin{bmatrix} 3 & 6 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ 4 \\ 5 \end{bmatrix}$ what is AB . Can you compute BA .
20. Express in matrix form, the system of equations :
- $$8w + 12x - 7y + 2z = 130$$
- $$3w - 13x + 4y + 9z = 240$$
21. Can one find the determinant of the matrix $A = \begin{bmatrix} 7 & 6 \\ 9 & 5 \\ 2 & 1 \end{bmatrix}$. Justify.
22. Write the standard linear programming problem.

(8 × 2 = 16)

Part C

Answer any **six** questions.

Each question carries 4 marks.

23. Draw the graph of the function $y = \frac{2}{x}$.
24. A person has \$ 120 to spend on two goods (X, Y) whose respective prices are \$ 3 and \$ 5.
- (a) Draw a budget line showing all the different combinations of two goods that can be bought with the given budget.
- (b) What happens to the original budget line if the budget falls by 25 %.

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25. Use elimination method to find the equilibrium price and quantity when the demand function is $3P + Q^2 + 5Q - 102 = 0$ and supply function is $P - 2Q^2 + 3Q + 71 = 0$.
26. Write the equation of the line passing through the points $(-1, 15)$ and $(3, 6)$.

27. Given $A = \begin{bmatrix} 0 & 1 & -6 & 2 \\ -3 & 5 & 4 & 2 \\ 2 & 8 & -1 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 7 & 2 & 12 & 6 & 5 \\ 4 & 3 & 8 & 10 & 4 \\ 1 & 0 & 5 & 11 & 8 \end{bmatrix}$ can you find $A + B$. Can one find AB . Justify your answer.

28. Given $A = \begin{bmatrix} 0 & -2 & 3 & 1 \\ 2 & 1 & 0 & 2 \\ 1 & -1 & 2 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 2 \\ 2 & -1 & 4 \\ 1 & 2 & 2 \\ 1 & 3 & 1 \end{bmatrix}$

Find AB if possible. Find BA if possible. If not Justify your answer.

29. Find the inverse of the matrix :

$$A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$$

30. Given $A = \begin{bmatrix} 4 & 7 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 6 \\ 5 \\ 1 \end{bmatrix}$, $C = \begin{bmatrix} 9 \\ 5 \\ 8 \end{bmatrix}$, verify that $A(B + C) = AB + AC$.

31. What do you understand by graphical method of solving a L.P.P. Give its limitations.

$(6 \times 4 = 24)$





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Part D

*Answer any **two** questions.*

Each question carries 15 marks.

32. (a) Solve $9(3x+4) - 2x = 11 + 5(4x-1)$.

(b) Solve $5x^2 + 23x + 12 = 0$.

(c) Given $Y = C + I$, $C = 50 + 0.8 Y$ and $I_0 = 50$:

(i) Graph the consumption function.

(ii) Graph the aggregate demand function.

33. Find (a) The equilibrium income level and rate of interest ; and (b) The levels of C, I, μ_f and μ_z in equilibrium when $C = 89 + 0.6 Y$, $I = 120 - 150 i$.

34. (a) Use matrix inversion method to solve the system of equations :

$$2x_1 + 4x_2 - 3x_3 = 12$$

$$3x_1 - 5x_2 + 2x_3 = 13$$

$$-x_1 + 3x_2 + 2x_3 = 17.$$

(b) Use Cramer's rule to solve the system of equations :

$$7p_1 + 2p_2 = 60$$

$$p_1 + 8p_2 = 78$$

35. (a) Solve graphically the L.P.P. :

$$\text{Minimize } z = 7x_1 + 3x_2$$

subject to the constraints :

$$x_1 + 2x_2 \geq 3$$

$$x_1 + x_2 \leq 4$$

$$0 \leq x_1 \leq 5/2$$

$$0 \leq x_2 \leq 3/2.$$





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(b) Find the maximum and minimum values of :

$$z = 5x_1 + 3x_2$$

subject to the constraints :

$$x_1 + x_2 \leq 6$$

$$2x_1 + 3x_2 \geq 3$$

$$0 \leq x_1 \leq 3$$

$$0 \leq x_2 \leq 3.$$

(2 × 15 = 30)

