Registration number:

Date & Session:

ST JOSEPH'S UNIVERSITY, BENGALURU-27
UG OPEN ELECTIVES - I SEMESTER
SEMESTER EXAMINATION: OCTOBER 2023
(Examination conducted in November / December 2023)

(For current batch students only)

MTOE1 - BUSINESS MATHEMATICS

Time- 2 hrs Max Marks-60

This question paper contains **TWO** printed pages and **THREE** parts.

Calculators are **not** allowed.

I. Answer any SIX full questions **[6 x 2 = 12]**

1. Mia and Ben are selling tickets for a school fundraiser. Mia sells adult tickets for $10 each and child tickets for $5 each. Ben sells adult tickets for $8 each and child tickets for $6 each. In one day, they sell a total of 50 tickets and collect $350 in revenue. Frame a pair of linear equation in order to find how many adult and child tickets did each of them sell.
2. When can we say that a set of linear equations are consistent? Write the condition to verify the consistency with unique solution.
3. Find the roots of the equation $x^2 + 5x + 6 = 0$, by factorization method.
4. Determine whether the matrix $\begin{bmatrix} 3 & 12 \\ 2 & 8 \end{bmatrix}$ is singular or non-singular.
5. State any two properties of matrix addition.
6. Explain continued ratio with an example.
7. State the following properties of proportion (i) Addendo (ii) Dividendo
8. Define direct proportion. Give an example.

II. Answer any THREE full questions **[3 x 6 = 18]**

9. Form the pair of linear equations for the following problem and find the solution. The taxi charges in a city consist of a fixed charge together with the charge for the distance covered. For a distance of 10 km, the charge paid is Rs 105 and for a journey of 15 km, the charge paid is Rs 155.
   (i) What are the fixed charges and the charge per km?
   (ii) How much does a person have to pay for travelling a distance of 25 km? [4+2]
10. (i) Solve the equation by substitution method: $3x - y = 29, -2x + 5y = -2$.
    (ii) Solve the equation by cross multiplication method: $8x + 5y - 9 = 0, 3x + 2y - 4 = 0$. [3+3]
11. Prove that the systems of equations $3x + 5y = 12, 5x + 3y = 4$ has a unique solution and also find the solution.
12. The product of two consecutive positive integers is 306. Solve by framing the quadratic equation.
13. Linda is planning to build a rectangular garden in her backyard. She wants the garden to have a length, which is 5 meters longer than its width. If the area of the garden is 72 square meters, what will be the dimensions (length and width) of the garden?

III. Answer any FIVE full questions **[5 x 6 = 30]**

14. If $\mathrm{A} = \begin{bmatrix} 1 & 8 \\ 4 & 3 \end{bmatrix}, \mathrm{B} = \begin{bmatrix} 1 & 3 \\ 7 & 4 \end{bmatrix}$ and $\mathrm{C} = \begin{bmatrix} -4 & 6 \\ 3 & -5 \end{bmatrix}$ prove that $(\mathrm{AB})\mathrm{C} = \mathrm{A}(\mathrm{BC})$.
15. Find the inverse of the matrix $A = \begin{bmatrix} 3 & 1 & -1 \\ 2 & -2 & 0 \\ 1 & 2 & -1 \end{bmatrix}$.
16. Solve the following system of equations, using matrix inversion method:
    $2x_1 + 3x_2 + 3x_3 = 5, x_1 - 2x_2 + x_3 = -4$ and $3x_1 - x_2 - 2x_3 = 3$.
17. (i) Define order of a matrix and give an example for 3×2 matrix.
    (ii) Define diagonal matrix and give an example.
    (iii) An electric pole, 14 metres high, casts a shadow of 10 metres. Find the height of a tree that casts a shadow of 15 metres under similar conditions. [2+2+2]

18. (i) Ratio of incomes of Ram and Ravi is 4:3 and expenditure ratio is 3:2. Each person saves Rs. 2500. Find their income.
    (ii) A train is moving at a uniform speed of 75 km/hour. How far will it travel in 20 minutes? [4+2]

19. The ratio of annual incomes of A and B is 4:3 and their annual expenditure is 3:2. If each of them saves Rs.1000 a year, find their annual income.

20. (i) Janet bought a coat which usually sells for Rs. 980.00 at 25% off. What did she pay for the coat?

    (ii) If the population of a city in 2014 was 10,00,000. If in 2015 there is an increment of 15%, in 2016 there is a decrement of 35% and in 2017 there was increment of 45%. Find the population at the end of 2017. [2+4]