# AHMEDABAD UNIVERSITY
# AMRUT MODY SCHOOL OF MANAGEMENT
# GRADUATE PROGRAMMES
## 2023- 2024 MONSOON SEMESTER
## MID SEMESTER EXAMINATION
## TOD504 MATHEMATICAL METHODS FOR ECONOMICS

**Date: 17-09-2023** | **Total Marks: 30**
**Time limit: 2 hours** | **No. of printed pages: 01**

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1. Solve for $x$:
   (a) $1 + \frac{2x}{x^2+1} = 0$ (1 mark)
   (b) $\frac{x}{x-1} + 2x = 0$ (1 mark)
   (c) $8 - 0.2x \leq \frac{4-0.1x}{0.5}$ (2 marks)
2. Determine the elasticity of demand for train journeys on a given route when the demand function is $Q = \frac{1200}{P^{1.2}}$, where $Q$ is the number of fares in thousands. (2 mark)
   (a) If the fare increases by 5%, use elasticity to calculate the percentage change in demand. (2 marks)
   (b) If the company charges $30 per fare, calculate the corresponding number of fares demanded to the nearest fare. (1 marks)
3. A hotel charges different prices for the same meal in two different markets. The demand function in each market is given by the respective equations
   $P_1 = 100 - 8Q_1$ and $P_2 = 160 - 6Q_2$
   The company's cost function is given by the equation
   $TC = 120 + 8Q$ where $Q = Q_1 + Q_2$
   (a) Find the price and quantity at which profit is maximized for each market. Calculate the overall profit from the two markets. (3 + 1 = 4 marks)
   (b) If price discrimination is declared illegal, what price should the company charge to maximize profits? Calculate the overall profit. How does it compare with the profit made under price discrimination? (3+1+1 = 5 marks)
4. We have the following functions given to us:
   $TR = Q(120 - 0.8Q)$
   $AC = Q^2 + \frac{2}{Q} + 8$
   (a) Find the output, $Q$, at which profit is maximized and minimized. (3 marks)
   (b) Find the values of output, $Q$, for which MC, AVC, ATC are minimized and sketch the graphs of these functions. (6 marks)
   (c) Sketch profit, TR, TC in one graph. Sketch MR, MC vertically below it. (3 marks)