UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, January 2021

Course: **Mathematical Economics I**   Semester: **I**
Program: **BA (Hons.) Economics**   Time: **03 Hours.**
Course Code: **ECON1017**   Max. Marks: **100**

SECTION A
Each question carries 5 marks.

S. No.	Questions	CO
Q1	Let $A = \{x \mid x = n^2$, where $n = 1, 2, 3, 4\}$. Write set A in roster form.	CO1
Q2	$y = \sqrt{3 - x}$, Find the range and domain of the function.	CO1
Q3	$f(x) = x^2 + 1$, Find $f(-1)$, $f(0)$ and $f(2)$	CO1
Q4	A = {2, 3, 5, 6, 7, 8}, B = {1, 2, 5, 6, 8, 10} and C = {3, 5, 9, 12} Find $(A \cup B) \cup C$, $(A \cap B) \cap C$, $(A \cap B) \cup C$	CO1
Q5	Let $y = 30x - 2x^2$. Find the value of x at which the function is at maximum	CO2
Q6	Let $A = \begin{bmatrix} 4 & 9 \\ 2 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 7 \\ 5 & 4 \end{bmatrix}$ Find the rank of matrix A and B.	CO2

SECTION B
Each question carries 10 marks.

Q 7	$z = 2x^3 - 3x^2 + 400x + 50$, where $x > 0$. Determine if this function is convex or concave.	CO2
Q 8	Use Cramer's rule to solve for the unknowns in the following system of equations. $4x + y - 5z = 8$ $-2x + 3y + z = 12$ $3x - y + 4z = 5$	CO3
Q 9	Find the inverse of matrix A, which is given below. $A = \begin{bmatrix} 4 & 2 & 5 \\ 3 & 1 & 8 \\ 9 & 6 & 7 \end{bmatrix}$	CO1

Q 10	$f(x) = x^3 - 18x^2 + 96x - 80$ Find the critical values of x. Determine whether the function is at relative maximum or relative minimum. Identify the inflection point.	CO3
Q 11	Integrate of the following functions. $f(x) = 1/\sqrt{x}$ $f(x) = 2x^8 + 2$	CO1

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Section C
Each question carries 20 Marks. Answer any one question.

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Q12	Optimize the following utility function $U = x^{0.3}y^{0.5}$ subject to the budget constraint $6x + 2y = 384$, where x and y represent two different goods. Price per unit of x and y are Rs. 6 and Rs. 2, respectively. Income of the consumer is Rs. 384. Find the value of x and y at which the utility function is maximum. OR $z = 3x^3 - 5y^2 - 225x + 70y + 40$ Find the critical values of x and y. Determine whether the function is at relative maximum, relative minimum, inflection point or saddle point.	CO4