UNIVERSITY OF PETROLEUM & ENERGY STUDIES
DEHRADUN
End-Semester Examination 2021

Program/course	: MA Economics	Semester	: I
Subject	: Mathematical Economics-I	Max. Marks	: 100
Code	: ECON 7020	Duration	: 3 Hrs
No. of page/s	: 2		

SECTION A

1. Each Question will carry 5 Marks
2. Instruction: Write **T** for true and **F** for false

Q1	Verify MPP of L and K: Cobb-Douglas production function $(\alpha + \beta = 1)$ $Q = 96K^{0.3} L^{0.7}$ $MPP_K = \dfrac{\partial Q}{\partial K} = (0.3)96K^{-.7}L^{0.7} = 28.8K^{-.7}L^{0.7}$ $MPP_L = \dfrac{\partial Q}{\partial L} = (0.7)96K^{0.3}L^{-0.3} = 67.2K^{0.3}L^{-0.3}$	**[5]**	**CO1**
Q2	The following equations are non-linearly dependent to each other. $$y_1 = 2x_1 + 3x_2$$ $$y_2 = 4x_1^2 + 12x_1x_2 + 9x_2^2$$	**[5]**	**CO1**
Q3	The f_x of $f(x,y) = (x^2 - 1)/xy$ is $(x^2 + 1)/x^2y$	**[5]**	**CO1**
Q4	If the utility function of an individual takes the form $U = U(x_1, x_2) = (x_1 + 2)^2(x_2 + 3)^3$ where U is total utility and x_1 and x_2 are two commodities consumed, then the marginal utility of 3 units of each commodity consumed is 2160.	**[5]**	**CO1**
Q5	The income – elasticity of the consumption function $C = a - bY$ with (a>0; 0<b<1) is $\dfrac{bY}{a+bY}$.	**[5]**	**CO1**
Q6	The stationary value of $y = -2x^2 + 8x + 7$ is 15	**[5]**	**CO1**

	SECTION B		
1. Each question will carry 10 marks 2. Instruction: Answer all questions			
Q7.	Given Q=200-5P+0.05Y, where, Q is quantity demanded, P is price, and Y is income, and given P= 50 and Y= 10000, find the price and income elasticity of demand.	[10]	CO2

Q8.	Find total differentials for the following utility functions:
	
	   a. $U(x_1, x_2) = ax_1 + bx_2$
	
	   b. $U(x_1, x_2) = x_1^2 + x_2^3 + x_1 x_2$
	
	   c. $U(x_1, x_2) = x_1^a x_2^b$
		[10]	CO2

Q9	For each F(x,y,z) = 0 use the implicit function rule to find $\partial y / \partial x$ and $\partial y / \partial z$.
	
	   (a) $F(x,y,z) = x^3 y^4 + z^3 + xyz = 0$
	
	   (b) $F(x,y,z) = 3x^2 y^2 + xz^3 y^2 + y^3 zx^3 + y^2 z = 0$
		[10]	CO2

Q10.	Use the Langrage- multiplier method to find the stationary value of z. $z = xy$, subject to $x + 2y = 2$	[10]	CO3
Q11.	Find the partial total derivatives $\dfrac{\delta w}{\delta u}$ and $\dfrac{\delta w}{\delta v}$ if $w = ax^2 + bxy + cu$, where $x = \alpha u + \beta v$ and $y = \gamma u$. (Use channel Map)	[10]	CO3
Section C			
1. Each Question carries 20 Marks. **2. Instruction: Solve the problems**			

Q12.	A firm has the following total cost and demand functions:
	
	$C = \dfrac{1}{3} Q^3 - 7Q^2 + 111Q + 50$; $Q = 100 - P$
	
	   a. Does the total cost function satisfy the coefficient restrictions?
	
	   b. Write out total revenue function R in terms of Q.
	
	   c. Formulate the total profit function π in terms of Q.
	
	   d. Find profit maximization level of output Q^*.
	
	   e. What is the maximum profit?
		[20]	CO4