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UNIVERSITY OF PETROLEUM & ENERGY STUDIES
DEHRADUN
End Semester Examination- Dec 2018

Program/course: MA Economics (Energy Economics) **Semester : I**
Subject: QUANTITIVE METHODS IN ECONOMICS **Max. Marks : 100**
Code : ECON 7002 **Duration : 3 Hrs**
No. of page/s: 3

Section A (attempt all)

Q1. Fill in the blanks

i.	If $R = PQ$ and $P = 20\text{-}Q$, then $\frac{dR}{dQ}$ =_____	**[2]**	**CO1**
ii.	$\frac{d}{dx}\left[\frac{z(x)}{v(x)}\right]$ =_____.	**[2]**	**CO1**
iii.	$\frac{dR}{dL} = \frac{dR}{dQ} \cdot$ _____	**[2]**	**CO1**
iv.	If $Q = 96K^{0.2} L^{0.8}$ then MPP_K =_____.	**[2]**	**CO1**
v.	Let y = $f(x_1, x_2)$. Then the total differential, dy = _____.	**[2]**	**CO1**

Q2. Prepare a table given below and classify the following differential equations by marking tick (√) in appropriate box.

DE No.	Equation	Ordinary	Partial	Linear	Nonlinear		
i.	$y' + xy = e^x$					**[2]**	**CO1**
ii.	$y'' + yy' = x$					**[2]**	**CO1**
iii.	$x2y''' - \sqrt{xy} = 0$					**[2]**	**CO1**
iv.	$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = x^2 y$					**[2]**	**CO1**
v.	$\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial x} + uy = 0$					**[2]**	**CO1**

	SECTION B **Answer any four questions**		
Q3.	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. $U(x_1, x_2) = x_1^a x_2^b$	**[5]**	**CO3, CO4**
Q4.	For each F(x,y,z) = 0 use the implicit function rule to find $\partial y / \partial x$ and $\partial y / \partial z$. (a) $F(x,y,z) = x^3y^4 + z^3 + xyz = 0$ (b) $F(x,y,z) = 3x^2y^2 + xz^3y^2 + y^3zx^3 + y^2z = 0$	**[5]**	**CO3, CO4**
Q5.	Find the total differential, given, $U = \frac{G_1}{G_1 + G_2}$	**[5]**	**CO3, CO4**
Q6.	Answer any one question. i. Find general solution of the differential equation: $\frac{dy}{dt} + 2ty = t$ ii. 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.	**[5]**	**CO3, CO4**
Q7.	Answer any one question. i. If the marginal propensity to save (MPS) is the following function of income, $S'(Y) = 0.3 - 0.1Y^{-0.5}$, and if the aggregate saving S is nil when income Y is 81 find the saving function $S(Y)$. ii. Find the elasticity (E_d) if the demand function is: Q=250-5P. Determine whether the demand is elastic at P = 20.	**[5]**	**CO3, CO4**
	SECTION C **Answer any two questions**		
Q8.	Verify that each of the following differential equations is exact and solve by the four step procedure: (a) $3y^2tdy + (y^3 + 2t)dt = 0$ (b) $t(1+2y)dy + (y^3 + 2t)dt = 0$	**[15]**	**CO1, CO4**

Q9.	Find the partial total derivatives $\frac{\delta w}{\delta u}$ and $\frac{\delta w}{\delta v}$ if $w = ax^2 + bxy + cu$, where $x = \alpha u + \beta v$ and $y = \gamma u$. (Use channel Map)	**[15]**	**CO3, CO4**
Q10.	Discuss the assumptions made in a linear programming problem. Find the graphical solution for the following LPP? Maximize: $z = 6y_1 + 7y_2$ Subject to : $2y_1 + 3y_2 \leq 12$ $2y_1 + y_2 \leq 18$ $(y_1, y_2) \geq 0$	**[15]**	**CO3, CO4**
Q10.	What do you mean by comparative static analysis? Explain with example role of differention in comparative static analysis.	**[15]**	**CO3, CO4**
	Section D **Answer any one question**		
Q11.	Let the demand and supply be: $Q_d = \alpha - \beta P - n\frac{dP}{dt}; \quad Q_s = \delta P \quad (\alpha, \beta, n, \delta > 0)$ (a) Assume that the market is cleared at every point of time, find the time path P(t) (general solution) (b) Does this market have a dynamically stable intertemporal equilibrium price? Examine.	**[30]**	**CO1, CO3, CO4**
Q12.	Using simplex method solve the following linear programming problem: Maximize: $\pi = 6z_1 + 2z_2 + 5z_3$ Subject to : $2z_1 + 3z_2 + z_3 \leq 10$ $z_1 + 2z_3 \leq 8$ $z_1 + 2z_2 + 5z_3 \leq 19$ $(z_1, z_2, z_3,) \geq 0$	**[30]**	**CO1, CO3, CO4**
Q13.	A firm has the following total cost and demand functions: $C = \frac{1}{3}Q^3 - 7Q^2 + 111Q + 50; \; Q = 100 - P$ 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?	**[30]**	**CO1, CO3, CO4**