Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Program: BBA Oil & Gas Marketing — **Semester: I**
Course: Business Mathematics — **Time: 03 Hours**
Course code: DSQT 1001 — **Max. Marks: 100**
No. of pages:03

SECTION A
(Answer ALL the questions. Total marks: 20)

Q1.	**Answer ALL the questions. Each carries ONE mark. Total Marks =5**	**Marks**	**CO**
A.	The value of $4A - 3B$ where $A = \begin{bmatrix} 2 & 6 \\ 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 4 & 9 \end{bmatrix}$ is (a) $\begin{bmatrix} 5 & 22 \\ 0 & 24 \end{bmatrix}$ (b) $\begin{bmatrix} 5 & 24 \\ 0 & -23 \end{bmatrix}$ (c) $\begin{bmatrix} 5 & 20 \\ -10 & 16 \end{bmatrix}$ (d) $\begin{bmatrix} 5 & 4 \\ 5 & 12 \end{bmatrix}$	**01M**	**CO1**
B.	If the rank of $\begin{bmatrix} 1 & 3 \\ k & 6 \end{bmatrix}$ is 1, the value of k is (a) 1 (b) 2 (c) 3 (d) 0	**01M**	**CO1**
C.	Which of the following is a linear equation (a) $x = y - 6$ (b) $y = (x+2)^2$ (c) $y = 4x^2$ (d) $None$	**01M**	**CO2**
D.	The value of $\int_0^2 (x^2 + 2)dx$ is (a) $-\frac{20}{6}$ (b) 0 (c) $\frac{20}{3}$ (d) $None$	**01M**	**CO2**
E.	The quantity $\frac{total\ revenue}{quantity\ of\ the\ commodity\ sold}$ is called (a) $Price$ (b) $Discount$ (c) $Average\ Revenue$ (d) $None$	**01M**	**CO2**
Q2.	**Answer ALL the questions. Each carries THREE marks Total Marks =15**		
A.	Let $A = \begin{bmatrix} 2 & x \\ 3 & y \end{bmatrix}$. If A is idempotent, the values of x and y are (a) $x = -\frac{2}{3}, y = 1$ (b) $x = \frac{2}{3}, y = -1$ (c) $x = 0, y = 1$ (d) $None$	**03M**	**CO1**
B.	The equation of the line joining the points $(-1, 0)$ and (3,8) is (a) $2x + y = 2$ (b) $y = 2x + 2$ (c) $x = 2y + 4$ (d) $None$	**03 M**	**CO2**
C.	The value of $\int \frac{1}{x\sqrt{x}}\, dx$ is (a) $\frac{-2}{\sqrt{x}} + C$ (b) $\frac{2}{\sqrt{x}} + C$ (c) $\frac{\sqrt{x}}{2} + C$ (d) $None$	**03 M**	**CO2**
D.	If the marginal revenue of a firm is given by $MR = 30 - 10x + x^2$, the total revenue of the firm at 6 units of output is (a) 76 (b) 72 (c) 60 (d) $None$	**03 M**	**CO3**
E.	The value of elasticity of demand η_d of the function $x = 100 - 5p$ at $p = 10$ is (a) 5 (b) 0 (c) 1 (d) $None$	**03M**	**CO3**

	SECTION B **(Answer ALL the questions. Each question carries FIVE marks. Total marks: 20)**		
Q3.	Show that $A = \begin{bmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 3A + 2I_3 = 0$ where I_3 is the identity matrix of order 3.	**5M**	**CO1**
Q4.	Find $\frac{dy}{dx}$ when $y = u^2 + 2, u = v^2 + 2$ and $v = x^2 - x$.	**5M**	**CO2**
Q5.	Find maxima, minima and the points of inflexion for the function $y = x^3 + 10x^2 + 25x - 40.$	**5M**	**CO3**
Q6.	The marginal cost function of a firm is $MC = 5 + 3e^x$,where x denotes thousand units of output. Find (i) total cost C, if $C(0) = 250$ (ii) average cost AC and (iii) evaluate TC for 500 units of output.	**5M**	**CO4**
	SECTION C **(Answer ALL the questions. Each question carries SIX marks. Total marks: 30)**		
Q7.	Using Gauss-elimination, solve the following system of equations. $x + y + z = 6; x + 2y + 3z = 14; -x + y - z = -2$	**6M**	**CO1**
Q8.	If $y = x^{x^{x^{\cdot^{\cdot^{\infty}}}}}$, show that $\frac{dy}{dx} = \frac{y^2}{x(1 - y\log x)}$.	**6M**	**CO2**
Q9.	Evaluate $\int (7x - 2)\sqrt{3x + 2}\, dx$	**6M**	**CO3**
Q10.	Evaluate $\int \frac{x-1}{(x+1)(x-2)}\, dx$	**6M**	**CO3**
Q11.	The demand and cost functions of a monopolist are given to be $x = 500 - \frac{1}{2}p$ and $C = x^3 - 59x^2 + 1315x + 2000$ respectively. Find his profit maximizing level of output and price.	**6M**	**CO4**
	SECTION-D **(Answer any THREE questions. Each question carries TEN marks. Total marks: 30)**		
Q12.	Given the following national income model: $C = a + bY, \quad (a > 0, 0 < b < 1)$ $I = d - eY, \quad (d > 0, 0 < e < 1)$ $Y = C + I$ (i) Write the above system in matrix form. (ii) Solve for the endogenous variables C, I and Y. (iii) What is the necessary condition for obtaining a positive, finite solution for Y.	**10M**	**CO4**
Q13.	(i) The price elasticity of demand of a commodity when price is Rs. 10 and quantity demanded is 25 units is given to be 1.5. Find the demand equation of the commodity on the assumption that it is linear. (ii) Find the elasticity of demand of the inverse demand function $p = 3x^2 - 100x + 800$ when $x = 10$. Approximate this demand function by a linear function near this point.	**10M**	**CO4**

Q14.	The short run production function of a manufacturer is given as $x = 11L + 16L^2 - L^3$. (i) Find the average product function, AP_L, the marginal product function, MP_L, and show that $MP_L = AP_L$ where AP_L is maximum. (ii) Find the value of L for which output is maximum. (iii) Find the value of L at which the total product curve has a point of inflexion and verify that MP_L is maximum at this point. (iv) If the manufacturer sells the product at a uniform price of Rs. 10 per unit, find the maximum total revenue product.	**10M**	**CO4**
Q15.	(i) Obtain the demand function of a commodity whose elasticity of demand is given by $\eta = a - bp$, where a and b are constants and p denotes the price per unit of the commodity. (ii) The marginal revenue function of a firm is given by $MR = 240 - 4x$. Find the total revenue function and the demand function. At what level of output is the total revenue maximum? Find the maximum total revenue.	**10M**	**CO4**