Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: Business Mathematics and Statistics **Semester: I**
Course Code: DSIT 1007

Programme: B.Com (Hons.)/ B.Com(Hons.) Banking/ B.Com(Hons.) Taxation
Time: 03 hrs. **Max. Marks: 100**

Instructions: Answer **all** the questions from Section A, **Four** questions from Section B**, Three** questions from Section C and Section D is **compulsory.**

SECTION A (5*4 = 20 marks)

S. No.	Find the derivative *dy/dx* of the following functions (Q 1 to Q 3)	Marks	CO
Q 1	$y = (2x^2 + 3x + 1)^3$	**4**	**1**
Q 2	$y = (5x^2 - 2)(4x + 1)$	**4**	**1**
Q 3	$y = (x^2 - 1)/(2x^3 + 6)$	**4**	**1**
	Find the integration of the following functions (Q 4 and Q 5)	**4**	
Q 4	$y = \int (2x^6 - 3x^4)\, dx$	**4**	**1**
Q 5	$y = \int_0^4 (3x^2 + 2x + 1)dx$	**4**	**1**

SECTION B (4*5 = 20 marks)

Q 1	Determine the rank (ρ) of the following matrix. $B = \begin{bmatrix} 5 & -9 & 3 \\ 2 & 12 & -4 \\ -3 & -18 & 6 \end{bmatrix}$	**5**	**1**
Q 2	Use implicit differentiation to find the derivative *dy/dx* for the following equation. $4x^2 - y^3 = 72$	**5**	**1**
Q 3	See if the following function is concave or convex at $x = 3$ $y = (5x^2 - 8)^2$	**5**	**2**
Q 4	Find the critical value(s) at which the following function is optimized. $y = x^3 - 6x^2 - 135x + 4$ Test the second-order condition to distinguish between a relative maximum or minimum.	**5**	**3**

Q 5	Assume that the rate of net investment is given as $I = 20t^{2/3}$, and capital stock (*K*) at $t = 0$ is 65. Find the capital stock function *K*.	**10**	**3**
SECTION-C (3*10 = 30 marks)			
Q 1	Assume that the marginal cost (MC) is given as $MC = 32 + 18Q - 12Q^2$, and fixed cost (*FC*) is 43. Find total cost (*TC*), average cost (*AC*) and variable cost (*VC*) functions.	**10**	**4**
Q 2	Let the total cost of production of x units of commodity is given as $C(x) = x^3 - 90x^2 + 7500x, x \geq 0.$ (a) Compute the marginal cost function $C'(x)$. (b) Find the value of *x* at which marginal cost is minimum.	**10**	**4**
Q 3	Let the total revenue function be $R = 4000Q - 33Q^2$and total cost function $C = 2Q^3 - 3Q^2 + 400Q + 5000$ and assume $Q > 0$. Find the level of output at which profit is maximum.	**10**	**3**
Q 4	Let A is a 3x3 matrix given as A = $\begin{bmatrix} 2 & 5 & 1 \\ 3 & 2 & 4 \\ 1 & 4 & 6 \end{bmatrix}$. Compute the inverse of matrix A.	**10**	**1**
SECTION-D (2*15 = 30 marks)			
Q 1	Use Lagrange multiplier to optimize the following function: $z = 4x^2 - 2xy + 6y^2$ subject to $x + y = 72$	**15**	**3**
Q 2	Use Cramer's rule to solve for the unknowns in the following system of equations. $2x + 4y - 3z = 12$ $3x - 5y + 2z = 13$ -$x + 3y + 2z = 17$	**15**	**2**