

Name:

Enrolment No:



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

**Course: Quantitative Techniques for Decision Making Course Code: CLNL 1005 Semester: I**

**Programme: BBA, LL.B. (Hons.) Corporate Laws 2018, BBA, LL.B. (Hons.)**

**Banking, Insurance and Finance / International Trade and Investment Law 2018,**

**B.COM., LLB. (Hons.) Taxation Laws / Media & Entertainment Laws 2018**

**Time: 03 hrs.**

**Max. Marks: 100**

**Instructions: Scientific calculators are allowed for the examination**

**SECTION A**

S. No.		Marks	CO
Q1	If $\begin{vmatrix} x & x \\ 1 & x \end{vmatrix} = \begin{vmatrix} 3 & 4 \\ 1 & 2 \end{vmatrix}$ , find the values of $x$ .	02	CO1
Q2	Find $\frac{d^3y}{dx^3}$ , where $y = x^2e^x$ . <b>OR</b> Evaluate the integral $\int 4x \sin(x) dx$ .	04	CO1
Q3	If $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ show that $A^T A$ and $AA^T$ are symmetric matrices. <b>OR</b> If $P = \begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}$ and $Q = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$ , find the matrix $R$ such that $7P + 8Q + 2R$ is a null matrix.	04	CO1

**SECTION B**

Q 4	If 4 times the 4 <sup>th</sup> term of an A.P. is equal to 9 times the 9 <sup>th</sup> term of the A.P., what is 13 times the 13 <sup>th</sup> term of this A.P.?	10	CO2
Q 5	In how many of the distinct permutations of the letters in <b>QUANTITATIVE</b> do the four <b>T</b> 's not come together?	10	CO2

**SECTION-C**

Q 6	A. Find $\frac{dy}{dx}$ at $x = 2$ , where $y = \frac{1+\sqrt{x}}{1-\sqrt{x}}$ .  B. Evaluate the integral $\int x\sqrt{x^2 + 3} dx$ (use substitution $x^2 + 3 = t^2$ ).	(5×2)= 10	CO1
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Q 7	Find the extremum for the function $y = x^3 + 10x^2 + 25x - 40$ .	10	CO3
<b>SECTION-D</b>			
Q 8	<p>A. Find the rank of <math>\begin{bmatrix} 0 &amp; 16 &amp; 8 &amp; 4 \\ 2 &amp; 4 &amp; 8 &amp; 16 \\ 16 &amp; 8 &amp; 4 &amp; 2 \\ 4 &amp; 8 &amp; 16 &amp; 2 \end{bmatrix}</math>.</p> <p>B. Find the values of <math>x, y</math> and <math>z</math> if the matrix <math>A = \begin{bmatrix} 0 &amp; 2y &amp; z \\ x &amp; y &amp; -z \\ x &amp; -y &amp; z \end{bmatrix}</math> satisfies <math>A^T A = I</math>.</p>	(10×2) =20	CO1
Q 9	Ram invests a total sum of 2000 rupees on government bonds in 4 years. If these investments are in A.P and the sum of squares of the investments is 1200000 rupees. Find the investment made each year respectively. It is also known that he always invest more than the previous year.	20	CO4
Q 10	The marginal revenue function of a firm is given by $MR = 380 - 5x$ . Find the total revenue and deduce the demand function.	10	CO4

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**SECTION A**

S. No.		Marks	CO
Q 1	For what values of $x$ , the matrix $\begin{bmatrix} 5-x & x+1 \\ 2 & 4 \end{bmatrix}$ is singular?	02	CO1
Q 2	Find $\frac{d^3y}{dx^3}$ , where $y = x^9e^x$ . <b>OR</b> Evaluate the integral $\int 6x \cos(x) dx$ .	04	CO1
Q 3	If $B = \begin{bmatrix} 3 & 2 & 5 \\ 4 & 1 & 3 \\ 0 & 6 & 7 \end{bmatrix}$ , show that $B + B^T$ and $B - B^T$ are symmetric and skew symmetric matrix, respectively. <b>OR</b> If $P = \begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}$ and $Q = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$ , find the matrix $R$ such that $5P + 3Q + R$ is a null matrix.	04	CO1

**SECTION B**

Q 4	A box contains three white balls, four black balls and three red balls. Find the number of ways in which three balls can be drawn from the box so that at least one of the balls is black.	10	CO2
Q 5	Sum of first 12 terms of a GP is equal to the sum of the first 14 terms in the same GP. Sum of the first 17 terms is 92, what is the third term in the GP?	10	CO2

**SECTION-C**

Q 6	<p>A. Find <math>\frac{dy}{dx}</math> at <math>x = 1</math>, where <math>y = \frac{3-x^{\frac{1}{2}}}{2+x^{\frac{2}{3}}}</math>.</p> <p>B. Evaluate the integral <math>\int 4x\sqrt{x^2 + 3} dx</math> (use substitution <math>x^2 + 3 = t^2</math>).</p>	(5×2)= <b>10</b>	<b>CO1</b>
Q 7	Determine the conditions under which the function $y = ax^2 + bx + c$ will have (i) a maxima (ii) a minima. (where $a$ and $b$ are constants)	<b>10</b>	<b>CO3</b>
<b>SECTION-D</b>			
Q 8	<p>A. Using ERT method find the inverse of <math>\begin{bmatrix} 2 &amp; -1 &amp; 4 \\ 4 &amp; 0 &amp; 2 \\ 3 &amp; -2 &amp; 7 \end{bmatrix}</math>.</p> <p>B. Sum of first 25 terms in AP is 525, sum of next terms is 725, what is the common difference?</p>	(10×2) <b>=20</b>	<b>CO1</b>
Q 9	The prices, in rupees per unit, of the three commodities $X, Y$ and $Z$ are $x, y$ and $z$ , respectively. $A$ purchases 4 units of $Z$ and sells 3 units of $X$ and 5 units of $Y$ . $B$ purchases 3 units of $Y$ and sells 2 units of $X$ and 1 unit of $Z$ . $C$ purchases 1 unit of $X$ and sells 4 units of $Y$ and 6 units of $Z$ . In the process, $A, B$ and $C$ earn Rs. 6000, 5000 and 13000, respectively. Using matrices, find the prices of the three commodities. (note that selling the unit is positive earning and buying the units is negative earning).	<b>20</b>	<b>CO4</b>
Q 10	The demand function of a commodity is given by $p = \frac{150}{x^2+2} - 4$ , where $p$ is price per unit and $x$ denotes quantity. Determine the marginal revenue function.	<b>10</b>	<b>CO4</b>