Name:

Enrolment No:

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

Course: Mathematics **Semester: I**

Programme: B. Sc., L. L. B. (Hons) IPR/FHEL/MFL **Course Code: CLNL1030**

Time: 03 hrs. **Max. Marks: 100**

Instructions: Attempt all questions from **Section A** (each carrying 2 marks); all questions from **Section B** (each carrying 10 marks); all questions from **Section C** (carrying 10 marks) and all questions from **Section D (**carrying 20 marks)

SECTION A
(Attempt all questions)

S. No.		Marks	CO
Q 1	Find the value of x for which $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$.	**2**	**CO1**
Q 2	If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6, 7\}$, then find $A \backslash B$, $A \cup B$.	**2**	**CO2**
Q 3	Represent $\frac{5-3i}{2+3i}$ in terms of $a + ib$.	**2**	**CO2**
Q 4	If $y = \sin(2x^2 + 3)$, find $\frac{dy}{dx}$.	**2**	**CO3**
Q 5	Construct the truth table for $p \wedge q$.	**2**	**CO4**
	SECTION B **(Attempt all questions)**		
Q 6	Shade the sets $A \cap B^c$, $(B/A)^c$ in Venn Diagram.	**10**	**CO2**
Q 7	Find the right hand and left hand limits of $\lim_{x \to 2} \frac{(2x-8)}{(x-2)}$. Is this limit exist?	**10**	**CO3**
	SECTION-C **(Q8-Q9 are compulsory. Q10 has internal choice)**		
Q 8	Solve the following system of equations by Cramer's Rule $3x - 2y + 3z = 8; \quad 2x + y - z = 1; \quad 4x - 3y + 2z = 4$	**10**	**CO1**
Q 9	A survey among 1000 people, 595 are democrats, 550 wear glasses and 550 like ice cream. 395 of them are democrats who wear glasses, 350 of them are democrats who like ice-cream, 400 of them wear glasses and like ice cream and 250 all the three.	**10**	**CO2**

	(a) How many of them are not democrats, do not wear glasses and do not like ice cream? (b) How many of them are democrats who do not wear glasses and do not like ice cream?		
Q 10	Evaluate **(a)** $\lim_{x\to 2} \frac{x^2+3x+2}{x-2}$ **(b)** $\lim_{x\to 0} \frac{x-\lvert x\rvert}{x}$ **OR** Find $\frac{dy}{dx}$ of the followings, if (a) $y = \sin(\log x)$ (b) $y = e^{x^2+3}$ (c) $y = x^2 \cos x$ (d) $y = \frac{x^2+2x+3}{x+1}$	**10**	**CO3**
SECTION-D **(Q 11 is compulsory. Q12A and Q 12B have internal choices)**			
Q 11A	Show that the statement $[p \wedge (p \to q)] \to q$ is a tautology.	**CO 4**	**10**
Q 11B	Construct the truth table for compound proposition $\sim(p \vee q) \vee (\sim p \wedge \sim q)$.	**CO 4**	**10**
Q12 A	Show that $p \to (q \to r) = (p \wedge q) \to r$. **OR** Using truth table verify the distributive law $p \vee (q \wedge r) = (p \vee q) \wedge (p \vee r)$.	**CO 4**	**10**
Q 12 B	Obtain the principal disjunctive normal form of the following (a) $p \to q$ (b) $q \vee (p \vee \sim q)$ **OR** Test the proposition $p \wedge (p \wedge r) \leftrightarrow (p \wedge q) \wedge r$ for the tautology.	**CO4**	**10**

Name: **Enrolment No:**	UPES

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SECTION A
(Attempt all questions)

S. No.		Marks	CO
Q 1	If $A = [2 \quad 3 \quad 2]$ and $B = \begin{matrix}2\\4\\7\end{matrix}$ find AB and BA.	**2**	**CO1**
Q 2	If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6, 7\}$, then find $B \backslash A$, $A \cap B$.	**2**	**CO2**
Q 3	Represent $\frac{3+5i}{3i+4}$ in terms of $a + ib$.	**2**	**CO2**
Q 4	If $y = e^{x^2+5x}$, find $\frac{dy}{dx}$	**2**	**CO3**
Q 5	Construct the truth table for $p \vee q$.	**2**	**CO4**
	SECTION B **(Attempt all questions)**		
Q 6	Shade the sets AUB^c, $(B - A)^c$ in Venn Diagram.	**10**	**CO2**
Q 7	Find the right hand and left hand limits of $\lim_{x \to 2} \frac{(x^2+3x+2)}{(x-2)}$. Is this limit exist?	**10**	**CO3**
	SECTION-C **(Q8-Q9 are compulsory. Q10 has internal choice)**		
Q 8	Solve the following system of equations by matrix method $3x - 2y + 3z = 8; \quad 2x + y - z = 1; \quad 4x - 3y + 2z = 4$	**10**	**CO1**

Q 9	Consider the set $N \times N$, the set of all ordered pairs of natural numbers. Let R be the relation in $N \times N$ which is defined by $(a, b)R(c, d)$ if and only if $a + d = b + c$. Prove that R is an equivalence relation.	**10**	**CO2**
Q 10	Evaluate **(a)** $\lim_{x\to 0} \frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}$ **(b)** $\lim_{x\to 0} \frac{\lvert\sin x\rvert}{x}$ **OR** Find $\frac{dy}{dx}$ of the followings, if (e) $y = \left(\frac{2x+3}{3x+5}\right)^{\frac{1}{2}}$ (f) $y = \sin x \cos x$ (g) $y = \log(x \sin x)$ (h) $y = \sin(\sin x)$	**10**	**CO3**
SECTION-D **(Q 11 is compulsory. Q12A and Q 12B have internal choices)**			
Q 11A	Show that the statement $p \wedge (p \wedge r) \leftrightarrow (p \wedge q) \wedge r$ is a tautology.	**CO 4**	**10**
Q 11B	Construct the truth table for compound proposition $(p \to q) \vee \sim (p \leftrightarrow q)$	**CO 4**	**10**
Q12 A	Show that $(p \vee q) \to r = (p \to r) \wedge (q \to r)$. **OR** Using truth table verify the distributive law $p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$.	**CO 4**	**10**
Q 12 B	Obtain the principal disjunctive normal form of the following (b) $\sim p \vee q$ (b) $q \wedge (q \vee \sim p)$ **OR** Test the proposition $[p \to (q \to r) \to \{(p \to q) \to (p \to r)\}]$ for the tautology.	**CO4**	**10**