Name: **Enrolment No:**	UPES

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

Course: MATH 1006-Mathematics **Semester: I**
Programme: BCA
Time: 03 hrs. **Max. Marks: 100**
Instructions:
Attempt all questions from **Section A** (each carrying 4 marks); attempt all questions from **Section B** (each carrying 8 marks)**;** attempt all questions from **Section C** (each carrying 20 marks)**.**

Section A
(Attempt all questions)

1.	Solve the following equation after reducing it into quadratic equation $\frac{1}{x^2}-\frac{3}{x}=4$.	**[4]**	**CO1**
2.	Evaluate the value of x, y, z and w if $3\begin{bmatrix} x & y \\ z & w \end{bmatrix}=\begin{bmatrix} x & 5 \\ -1 & 2w \end{bmatrix}+\begin{bmatrix} 6 & x+y \\ z+w & 5 \end{bmatrix}$.	**[4]**	**CO2**
3.	Differentiate the following function $\frac{e^x \sin x}{\sqrt{x}}$ with respect to x.	**[4]**	**CO3**
4.	Evaluate the integral $\int\left(\frac{1-\cos 2x}{\sin 2x}\right)dx.$	**[4]**	**CO3**
5.	Find the number of permutations of all the letters of the word (i) Committee (ii) Engineering.	**[4]**	**CO4**

SECTION B
(Q6-Q8 are compulsory and Q9-10 has internal choice)

6.	Prove that $\begin{vmatrix} a & b & c \\ b+c & c+a & a+b \\ a^2 & b^2 & c^2 \end{vmatrix}=-(a-b)(b-c)(c-a)(a+b+c).$	**[8]**	**CO1**
7.	Express $\begin{bmatrix} 3 & 5 & -7 \\ -8 & 11 & 4 \\ 13 & -14 & 6 \end{bmatrix}$ as the sum of a lower triangular matrix with zero leading diagonal and an upper triangular matrix.	**[8]**	**CO1**

8.	Determine the inverse of the following matrix $A=\begin{bmatrix}-1 & 1 & 2\\ 3 & -1 & 1\\ -1 & 3 & 4\end{bmatrix}$.	[8]	CO2
9.	Investigate the values of λ and μ so that the equations $2x+3y+5z=9;\ 7x+3y-2z=8;\ 2x+3y+\lambda z=\mu$ have **(i)** no solution, **(ii)** a unique solution and **(iii)** an infinite number of solutions. **OR** Investigate the values of m and n so that the equations $x+2y+z=4;\ x+y+z=6;\ x-2y+mz=n$ have **(i)** no solution, **(ii)** a unique solution and **(iii)** an infinite number of solutions.	[8]	CO2
10.	Evaluate $\lim\limits_{x\to 0}\dfrac{e^x\sin x-x-x^2}{x^2+x\log(1-x)}$. **OR** Evaluate the integral $\int\dfrac{x+1}{2x^2+3x+1}\,dx.$	[8]	CO3
SECTION C **(Q11 is compulsory and Q12A, Q12B have internal choice)**			
11.A	Find the differential coefficient of (i) $e^{\sin x^2}$ (ii)$\log\sin x^2$ with respect to x.	[10]	CO3
11.B	How many words can be formed with the help of 3 consonants and 2 vowels, such that no two consonants are adjacent?	[10]	CO4
12.A	Evaluate the integral $\int\dfrac{1}{(x-1)(x+2)(x+7)}\,dx.$ **OR** Evaluate the integral $\int\dfrac{3x+5}{x^3-x^2-x+1}\,dx.$	[10]	CO3
12.B	There are 3 true coins and 1 false coin with head on both sides. A coin is chosen at random and tossed 4 times. If head occurs all the 4 times, what is the probability that the false coin has been chosen and used? **OR** A shipment of 6 television sets contains 2 defective sets. A hotel makes a random purchase of 3 of the sets. If X is the number of defective sets purchased by the hotel, find the probability distribution of X.	[10]	CO4

Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Course: MATH 1006-Mathematics **Semester: I**

Programme: BCA

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

Instructions:

Attempt all questions from **Section A** (each carrying 4 marks); attempt all questions from **Section B** (each carrying 8 marks)**;** attempt all questions from **Section C** (each carrying 20 marks)**.**

Section A

(Attempt all questions)

1.	Determine the solution of the following equation after reducing it into quadratic equation $t^{1/2}+5t^{1/4}+7=0$.	**[4]**	**CO1**
2.	Determine the value of x, y, a and b if $\begin{bmatrix} 2x+4y & 2x-y \\ 2a+b & 3a-2b \end{bmatrix}=\begin{bmatrix} 3 & 11 \\ 3 & 8 \end{bmatrix}$.	**[4]**	**CO2**
3.	If $y=\cos^{-1}(1-x^2)$, then find $\frac{dy}{dx}$.	**[4]**	**CO3**
4.	Evaluate the following integral $\int \frac{1}{\sqrt{ax^2-bx+c}}\,dx.$	**[4]**	**CO3**
5.	A dice is thrown three times. Events A and B are defined as below: A= Getting 4 on third dice, B= Getting 6 on the first and 5 on the second throw. Determine the probability of A given that B has already occurred.	**[4]**	**CO4**

SECTION B

(Q6-Q8 are compulsory and Q9-10 has internal choice)

6.	Prove that $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix}=2abc(a+b+c)^3$.	**[8]**	**CO1**
7.	Prove that $\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}=(a-b)(b-c)(c-a)(a+b+c)$.	**[8]**	**CO1**

8.	Determine the inverse of the following matrix $A=\begin{bmatrix}2&3&5\\1&5&3\\2&3&7\end{bmatrix}$.	**[8]**	**CO2**
9.	Investigate the values of λ and μ so that the equations $2x+3y+5z=9$ $7x+3y-2z=8$ $2x+3y+\lambda z=\mu$ have **(i)** no solution, **(ii)** a unique solution and **(iii)** an infinite number of solutions. **OR** Investigate the values of m and n so that the equations $x+2y+z=4$ $x+y+z=6$ $x-2y+mz=n$ have **(i)** no solution, **(ii)** a unique solution and **(iii)** an infinite number of solutions.	**[8]**	**CO2**
10.	Differentiate $\tan^{-1}\left\{\frac{\sqrt{1-x^2}}{x}\right\}$ with respect to $\cos^{-1}\left(2x\sqrt{1-x^2}\right)$. **OR** Evaluate the following integral $\int_0^{\frac{\pi}{2}}\frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\sin x}}\,dx.$	**[8]**	**CO3**
SECTION C **(Q11 is compulsory and Q12A, Q12B have internal choice)**			
11.A	Evaluate $\lim_{x\to 0}\frac{e^x\sin x-x-x^2}{x^2+x\log(1-x)}$.	**[10]**	**CO3**
11.B	A bag contains 8 white and 6 red balls. Find the probability of drawing two balls of the same colour.	**[10]**	**CO4**
12.A	Evaluate the following integral $\int\frac{1}{(x-1)(x+2)^3}\,dx.$ **OR** Evaluate the following integral $\int_0^{\infty}\frac{1}{(x+1)(x^2+4)}\,dx.$	**[10]**	**CO3**
12.B	Three students A, B, C write an entrance examination. Their chances of passing 1/2, 1/3, 1/4 respectively. Find the probability that atleast one of them passes.	**[10]**	**CO4**

	OR Four boxes A, B, C and D contain 500, 300, 200 and 100 fuses respectively. The percentages of fuses in the boxes which are defective are 3%, 2%, 1% and 0.5% respectively. One fuse is selected at random arbitrarily from one of the boxes. It is found to be a defective fuse. Determine the probability that it has come from the box D.		