

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

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

Program: BCA (IoT and BFSI)
Course: MATHEMATICS
Course Code: MATH 1006

Semester: I
Time 03 hrs.
Max. Marks: 100

SECTION A
(Answer all the questions)

S. No.	Question	Marks	CO
Q 1.	Solve $x - 7\sqrt{x} + 6 = 0$	4	CO1
Q 2.	Test the continuity of the following function at the origin. $f(x) = \begin{cases} x & x \neq 0 \\ x & x = 0 \end{cases}$	4	CO3
Q 3.	Evaluate $\int \frac{e^{5 \log_e x} - e^{4 \log_e x}}{e^{3 \log_e x} - e^{2 \log_e x}} dx$	4	CO3
Q 4.	From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there in the committee. In how many ways can it be done?	4	CO4
Q 5.	When two dice are rolled, find the probability of getting a greater number on the first dice than the one on the second, given that the sum should equal 8.	4	CO4

SECTION B
(Answer all the questions. Q 9 has internal choice)

Q 6.	Solve the following system of linear equations by Cramer's rule. $3x + y + z = 2; 2x - 4y + 3z = -1; 4x + y - 3z = -11$	10	CO1
Q 7.	A, B and C are three candidates for the position of principal in a certain college whose chances of getting the appointment are in the proportion 4:2:3 respectively. The probability that A if selected would introduce co-education in the college is 0.3. The probabilities of B and C doing the same are respectively 0.5 and 0.8. (i) What is the probability that there will be co-education in the college after appointing one of them as principal? (ii) If there is co-education after the selection of principal, what is the probability that C is the principal?	10	CO4
Q 8.	Let A and B be independent events with $P(A) = \frac{1}{4}$ and $P(A \cup B) = 2P(B) - P(A)$. Find (i) $P(B)$ (ii) $P(A B)$ (iii) $P(B^c A)$.	10	CO4
Q 9.	Prove that $\int e^{ax} \cos bx \, dx = \frac{e^{ax}}{a^2+b^2} (a \cos bx + b \sin bx)$. (OR) Evaluate $\int \frac{1}{(x-1)^2(x+1)} \, dx$.	10	CO3

SECTION-C

(Answer all the questions. Q 11A-Q 11B have internal choice)

Q 10A.	Define continuity of a function on an interval. If $f(x) = \begin{cases} 5, & \text{if } x \leq 2 \\ ax + b, & \text{if } 2 < x < 10, \\ 21, & \text{if } x \geq 10 \end{cases}$ determine the values of a and b so that $f(x)$ is continuous.	10	CO3																
Q 10B.	If $y = (\sqrt{x})^{(\sqrt{x})^{(\sqrt{x})^{\dots\infty}}}$, show that $\frac{dy}{dx} = \frac{y^2}{x(2-y \log x)}$.	10	CO3																
Q 11A.	The daily cost C , of operating a hospital is a linear function of the number of in-patients I , out-patients P , plus a fixed cost a , i.e., $C = a + bP + dI$. Given the following data for three days, find the values of a, b and d by setting up a linear system of equations and solving them. <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;"><i>Day</i></th> <th style="padding: 5px;"><i>C</i></th> <th style="padding: 5px;"><i>I</i></th> <th style="padding: 5px;"><i>P</i></th> </tr> </thead> <tbody> <tr> <td style="padding: 5px; text-align: center;">1</td> <td style="padding: 5px; text-align: center;">6950</td> <td style="padding: 5px; text-align: center;">40</td> <td style="padding: 5px; text-align: center;">10</td> </tr> <tr> <td style="padding: 5px; text-align: center;">2</td> <td style="padding: 5px; text-align: center;">6725</td> <td style="padding: 5px; text-align: center;">35</td> <td style="padding: 5px; text-align: center;">9</td> </tr> <tr> <td style="padding: 5px; text-align: center;">3</td> <td style="padding: 5px; text-align: center;">7100</td> <td style="padding: 5px; text-align: center;">40</td> <td style="padding: 5px; text-align: center;">12</td> </tr> </tbody> </table> <p align="center">(OR)</p> An amount of Rs. 4,000 is distributed into three investments at the rate of 7%, 8% and 9% per annum respectively. The total annual income is Rs. 317.50 and the total annual income from the first investment is Rs. 5 more than the income from the second. Find the amount of each investment.	<i>Day</i>	<i>C</i>	<i>I</i>	<i>P</i>	1	6950	40	10	2	6725	35	9	3	7100	40	12	10	CO2
<i>Day</i>	<i>C</i>	<i>I</i>	<i>P</i>																
1	6950	40	10																
2	6725	35	9																
3	7100	40	12																
Q 11B.	Show that $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$ satisfies the equation $A^2 - 4A - 5I_3 = 0$ and hence find A^{-1} . <p align="center">(OR)</p> If $A = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, prove that $(adj A)A = A I_3$.	10	CO2																