

UOM Exam Second half 2021\_Question paper\_R2019/CSC 301 - Engineering Mathematics III /Sem-III / COMPUTER ENGINEERING / ARTIFICIAL INTELLIGENCE AND DATA SCIENCE / ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING / COMPUTER SCIENCE AND ENGINEERING (Artificial Intelligence and Machine Learning / COMPUTER SCIENCE AND ENGINEERING (Data Science) / COMPUTER SCIENCE AND ENGINEERING (Internet of Things and Cyber Security Including Block Chain Technology) / CYBER SECURITY / DATA ENGINEERING / INTERNET OF THINGS (IoT)

Dear Student,

Please note before you attempt this section of examination:

1. Q1, Q2, Q3 and Q4 carry 20 marks each.
2. This paper contains 20 Marks MCQ and 60 marks subjective section for 150 minutes duration.
3. It is mandatory for all the students to upload their answer papers in a single PDF format only.
4. You have to write Date of Examination, Seat number, Program, Scheme and semester, Subject name, Signature on EVERY PAGE.
5. Remain in the meet with your camera on and you in clear view throughout the duration of the exam.

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\* Required

1. Email \*

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2. Student Name (As per exam form filled) \*

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3. Seat No \*

Refer Hall ticket

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Solve Questions as per the instructions given separately.

- Please upload a single PDF for Q1 to Q4
- For MCQs Question write Question number & correct option with complete text in option.
- Q2 to Q4 are subjective questions - Solve Questions as per the instructions and marks allotted.

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The Laplace transform of $\int_0^t \frac{1-e^{au}}{u} du$ is
Option A:	$\frac{1}{s} \log\left(\frac{s-a}{s}\right)$
Option B:	$\frac{1}{s} \log\left(\frac{s-a}{s}\right)$
Option C:	$\frac{1}{s} \log\left(\frac{s-a}{s}\right)$
Option D:	$\frac{1}{s} \log\left(\frac{s-a}{s}\right)$
2	If $f(x) = \sqrt{1 - \cos x}$ , $0 < x < 2\pi$ then find $a_0$ .
Option A:	$\frac{2\sqrt{2}}{\pi}$
Option B:	$\frac{\sqrt{2}}{\pi}$
Option C:	$\frac{\sqrt{2}}{3\pi}$
Option D:	$\frac{1}{\pi}$

3.	If $f(z) = u + iv$ is analytic then
Option A:	$u$ is harmonic but $v$ may or may not be harmonic.
Option B:	$v$ is harmonic but $u$ may or may not be harmonic.
Option C:	$u$ and $v$ both need not be harmonic.
Option D:	$u$ and $v$ both harmonic.
4.	If $\text{Var}(X) = 4$ then $\text{Var}(3x+5)$ is
Option A:	12
Option B:	20
Option C:	26
Option D:	36
5.	If $f(x)$ is an even function in the interval $(-l, l)$ then in the Fourier series expansion of $f(x)$
Option A:	$a_n = 0, b_n = 0$ .
Option B:	$a_n = 0, a_0 = 0$ .
Option C:	$b_n = 0$ .
Option D:	$a_0 = 0, b_n = 0$ .
6	If $b_{yx} = 0.7764$ , $b_{xy} = 1.2321$ then coefficient of correlation
Option A:	0.9781
Option B:	0.6291
Option C:	1.2307
Option D:	0.0023

7	Find the constants a, b, c, d if $f(z) = x^2 + 2axy + 2by^2 + i(2cx^2 + dxy + y^2)$
Option A:	$a = 1, b = -\frac{1}{2}, c = -\frac{1}{2}, d = 2.$
Option B:	$a = 0, b = -\frac{1}{2}, c = -\frac{1}{2}, d = 2.$
Option C:	$a = 1, b = -2, c = -\frac{1}{2}, d = 1.$
Option D:	$a = 3, b = -\frac{1}{2}, c = -\frac{1}{2}, d = 2.$
8	If $X_1$ has mean 4 and variance 9 and If $X_2$ has mean -2 and variance 4 and they are independent then $Var(2X_1 + X_2 - 3)$ is
Option A:	41
Option B:	40
Option C:	36
Option D:	37
9	Suppose two fair dice are thrown and sum of the numbers on dice is noted, what is the probability that the sum can be equal to 6, 7, 8 or 9.
Option A:	2/9
Option B:	5/9
Option C:	4/9
Option D:	7/9
10.	Let $X$ denotes the demand in quintals and $Y$ denotes the price in rupees per kg. Also if $\bar{X} = 68, \bar{Y} = 69, \sum (X - \bar{X})^2 = 36, \sum (Y - \bar{Y})^2 = 44, \sum (X - \bar{X})(Y - \bar{Y}) = 24$ then the Karl Pearson's coefficient (r) of correlation is
Option A:	0.4030
Option B:	0.5030
Option C:	0.7030
Option D:	0.6030

Q2	Solve any Four out of Six 5 marks each
A	If $L\{\sin\sqrt{t}\} = \frac{\sqrt{\pi}}{2s\sqrt{s}} e^{-1/(4s)}$ , find $L\{\sin 2\sqrt{t}\}$
B	Find the inverse Laplace transform of $\frac{s+29}{(s+4)(s^2+9)}$
C	Find the Fourier series for $f(x)$ in $(0, 2\pi)$ where $f(x) = \begin{cases} x, & 0 < x \leq \pi \\ 2\pi - x, & \pi \leq x < 2\pi \end{cases}$
D	If $v = 3x^2y + 6xy - y^3$ , show that $v$ is harmonic function and find the corresponding analytic function.
E	Calculate the value of rank correlation coefficient from the following data regarding marks of 6 students in Statistics and Mathematics in a test: <i>Marks : Statistics</i> : 40, 42, 45, 35, 36, 39 <i>Marks : Mathematics</i> : 46, 43, 44, 39, 40, 43
F	Three factories $A, B, C$ produces 30%, 50% and 20% of the total production of an item. Out of their production 80%, 50% and 10% are defective. An item is chosen at random and found to be defective. Find the probability that it was produced by the factory $A$ .

<b>Q3</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	By using Laplace transform, prove that $\int_0^{\infty} e^{-t} \cdot \frac{\sin^2 t}{t} dt = \frac{1}{4} \log 5$	
B	Using convolution theorem, find the inverse Laplace transform of $\frac{1}{(s-2)^4 (s+3)}$	
C	Obtain Fourier series for $f(x) = x + x^2$ ; $-1 < x < 1$	
D	Find an analytic function $f(z) = u + iv$ , where $u + v = e^x (\cos y + \sin y)$	
E	State true or false with justification. "If two lines of regression are $x + 3y - 5 = 0$ and $4x + 3y - 8 = 0$ , then the correlation coefficient is $+0.5$ ".	
F	If the mean of the following distribution is 16. Find $m, n$ and variance. $X : 8, 12, 16, 20, 24$ $P(X) : 1/8 \quad m \quad n \quad 1/4 \quad 1/12$	

<b>Q4</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Find the Laplace transform of $e^{-4x} \int_0^x u \sin 3u du$	
B	Find the inverse Laplace transform of $\tan^{-1}\left(\frac{a}{s}\right)$	
C	Obtain half- range sine series for $f(x)$ where $f(x) = \begin{cases} x, & 0 < x < (\pi/2) \\ \pi - x, & (\pi/2) < x < \pi \end{cases}$	
D	Find the orthogonal trajectory of the family of curves given by $2x - x^3 + 3xy^2 = a$	
E	Fit a straight line to the following data. $(x,y) = (-1,-5), (1,1), (2,4), (3,7), (4,10)$ Estimate $y$ when $x = 7$	
F	A random variable $X$ has the following probability density function $f(x) = \begin{cases} ke^{-kx}, & x > 0, k > 0 \\ 0, & \text{elsewhere} \end{cases}$ Find the moment generating function and hence, the mean and variance.	

4. Please Upload complete scanned answer copy in a single PDF file. \*

Files submitted: