

These are sample MCQs to indicate pattern, may or may not appear in examination

University of Mumbai

Examination 2020

Program: BE Mechanical Engineering

Curriculum Scheme: Revised 2016

Examination: Second Year Semester III

Course Code: **MEC301** and Course Name: Applied Mathematics III

Time: 1 hour

Max. Marks: 50

=====

Note to the students: - All the Questions are compulsory and carry equal marks.

Q1.	Evaluate: $\int_0^{3+i} z^2 dz$ along the path $x = 2y$.
Option A:	(1+i)/5
Option B:	(2+10i)/5
Option C:	(1-5i)/3
Option D:	(2+11i)/3
Q2.	Evaluate: $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-2)(z-4)} dz$, $C: z = 3$.
Option A:	0
Option B:	$-\pi i$
Option C:	π
Option D:	πi
Q3.	Find Lauren't series for $f(z) = \frac{2}{(z-1)(z-2)}$ when $1 < z < 2$.
Option A:	$\frac{-2}{z} \left[1 + \frac{1}{z} + \frac{1}{z^2} + \dots \dots \right] - \left[1 + \left(\frac{z}{2}\right) + \left(\frac{z}{2}\right)^2 + \dots \dots \right]$
Option B:	$\frac{2}{z} \left[1 + \frac{1}{z} + \frac{1}{z^2} + \dots \dots \right] + \left[1 + \left(\frac{z}{2}\right) + \left(\frac{z}{2}\right)^2 + \dots \dots \right]$
Option C:	$\frac{-4}{z} \left[1 + \frac{1}{z} + \frac{1}{z^2} + \dots \dots \right] - \left[1 + \left(\frac{z}{2}\right) + \left(\frac{z}{2}\right)^2 + \dots \dots \right]$
Option D:	$\frac{-2}{z} \left[1 + \frac{1}{z} + \frac{1}{z^2} + \dots \dots \right] - 3 \left[1 + \left(\frac{z}{2}\right) + \left(\frac{z}{2}\right)^2 + \dots \dots \right]$
Q4.	Compute Residue for $f(z) = \frac{3z+1}{z(z-2)}$

Option A:	1/2, 2																		
Option B:	1/9, 6																		
Option C:	-1/2, 7/2																		
Option D:	7/2, 3/2																		
Q5.	Evaluate: $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+4)(x^2+9)} dx$																		
Option A:	$\pi/2$																		
Option B:	$\pi/5$																		
Option C:	$\pi/3$																		
Option D:	$\pi/4$																		
Q6.	Evaluate $\int_0^{2\pi} \frac{d\theta}{5+3 \sin\theta}$																		
Option A:	$\pi/2$																		
Option B:	$\pi/5$																		
Option C:	$\pi/3$																		
Option D:	π																		
Q7.	Evaluate: $\int_0^{\infty} e^{-3t} \left[\int_0^t \left(\frac{1-e^{-u}}{u} \right) du \right] dt.$																		
Option A:	$\log(4/3)$																		
Option B:	$\log(3/2)$																		
Option C:	$2\log(3/4)$																		
Option D:	$1/3 \log(4/3)$																		
Q8.	<p>The following data gives HDL and LDL cholesterol levels of 7 adults in a locality:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>HDL</td> <td>52</td> <td>63</td> <td>45</td> <td>36</td> <td>72</td> <td>65</td> <td>45</td> <td>25</td> </tr> <tr> <td>LDL</td> <td>62</td> <td>53</td> <td>51</td> <td>25</td> <td>79</td> <td>43</td> <td>60</td> <td>33</td> </tr> </table> <p>Obtain the rank correlation coefficient</p>	HDL	52	63	45	36	72	65	45	25	LDL	62	53	51	25	79	43	60	33
HDL	52	63	45	36	72	65	45	25											
LDL	62	53	51	25	79	43	60	33											
Option A:	-0.96																		
Option B:	0.95																		
Option C:	0.648																		
Option D:	0.223																		
Q9.	Find Laplace transform of $f(t) = \int_0^t \frac{\sin 2u}{u} du.$																		
Option A:	$\frac{1}{s} \left[\frac{\pi}{2} - \tan^{-1} \left(\frac{s}{2} \right) \right]$																		

Option B:	$\left[\frac{\pi}{2} - \tan^{-1}\left(\frac{S}{2}\right)\right]$																
Option C:	$2\left[\frac{\pi}{2} - \tan^{-1}\left(\frac{S}{2}\right)\right]$																
Option D:	$\frac{2}{S}\left[\frac{\pi}{2} - \tan^{-1}\left(\frac{S}{2}\right)\right]$																
Q10.	The equations of lines of regressions are $x + 2y = 5$ and $2x + 3y = -8$ then find means of x and y .																
Option A:	31,18																
Option B:	-31, 18																
Option C:	18, 12																
Option D:	-18, 12																
Q11.	The following data find the line of regression and estimate the value of y at $x = 15.5$ <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>10</td> <td>12</td> <td>13</td> <td>16</td> <td>17</td> <td>20</td> <td>25</td> </tr> <tr> <td>Y</td> <td>19</td> <td>22</td> <td>24</td> <td>27</td> <td>29</td> <td>33</td> <td>37</td> </tr> </table>	X	10	12	13	16	17	20	25	Y	19	22	24	27	29	33	37
X	10	12	13	16	17	20	25										
Y	19	22	24	27	29	33	37										
Option A:	$Y = 0.8x + 13.23$; 25.63																
Option B:	$Y = 8x + 10.23$; 30.63																
Option C:	$Y = 0.18x + 13.23$; 20.23																
Option D:	$Y = 0.8x + 10.23$; 22.63																
Q12.	Find $L^{-1}\left(\frac{s^2}{(s^2+1)^2}\right)$ by convolution theorem																
Option A:	$1/2(\text{sint} - t \text{cost})$																
Option B:	$1/2(\text{sint} + t \text{cost})$																
Option C:	$(\text{sint} + t \text{cost})$																
Option D:	$1/2(\text{sint} + \text{cost})$																
Q13.	Find Fourier series for $f(x) = x^2, -\pi < x < \pi$																
Option A:	$x^2 = \frac{\pi^2}{3} + \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} \cos nx$																
Option B:	$x^2 = \frac{\pi^2}{3} + 4 \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} \cos nx$																
Option C:	$x^2 = \frac{\pi^2}{3} - 4 \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} \cos nx$																
Option D:	$x^2 = \frac{\pi^2}{3} + 4 \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} \cos nx$																

Q14.	<i>Evaluate: $\oint_C \frac{z+4z}{z-6} dz$, where $z = 3$.</i>					
Option A:	-1					
Option B:	2					
Option C:	0					
Option D:	32					
Q15.	<i>Verify $v = e^x \sin y$ is harmonic or not</i>					
Option A:	Harmonic					
Option B:	Not Harmonic					
Q16.	<i>If $f(x) = 2x, 0 \leq x \leq 2\pi$, then find a_4.</i>					
Option A:	-0.2					
Option B:	0.4					
Option C:	0					
Option D:	3					
Q17.	<i>Find fixed point $w = \frac{3z-5i}{iz-1}$.</i>					
Option A:	5/i, i					
Option B:	2/i, -i					
Option C:	-1, 1					
Option D:	2i, i					
Q18.	<i>Solve $u_{xx} - u_t = 0$ with $u(0, t)=0, u(1, t) = 0, u(x, 0) =200(x - x^2)$ taking $h = 0.25$ for one time step by Crank – Nicholson simplified formula.</i>					
Option A:	t\x	0	0.25	0.50	0.75	1
	0	0	37.50	50	37.50	0
	1/16	0	19.64	28.57	19.64	0
Option B:	t\x	0	0.25	0.50	0.75	1
	0	0	20	50	20	0
	1/16	0	19.64	28.57	19.64	0
Option C:	t\x	0	0.25	0.50	0.75	1
	0	0	37.50	50	37.50	0
	1/16	0	50	20	50	0
Option D:	t\x	0	0.25	0.50	0.75	1
	0	0	40	50	40	0
	1/16	0	19.64	18.22	19.64	0

Q19.	Obtain Fourier series for f(x), where $F(x) = x + \frac{\pi}{2} \quad \text{for } -\pi < x < 0$ $= \frac{\pi}{2} - x \quad \text{for } 0 < x < \pi.$														
Option A:	$F(x) = 9 + \frac{2}{\pi} \sum_{n=0}^{\infty} \frac{1 - (-1)^n}{n^2} \cos nx$														
Option B:	$F(x) = 16 + \frac{2}{\pi} \sum_{n=0}^{\infty} \frac{1 - (-1)^n}{n^2} \cos nx$														
Option C:	$F(x) = \frac{4}{\pi} \sum_{n=0}^{\infty} \frac{1 - (-1)^n}{n^2} \cos nx$														
Option D:	$F(x) = \frac{2}{\pi} \sum_{n=0}^{\infty} \frac{1 - (-1)^n}{n^2} \cos nx$														
Q20.	Fit the straight line to the following data <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>x</td> <td>2</td> <td>1</td> <td>3</td> <td>5</td> <td>4</td> <td>3</td> </tr> <tr> <td>y</td> <td>10</td> <td>12</td> <td>10</td> <td>9</td> <td>8</td> <td>11</td> </tr> </tbody> </table>	x	2	1	3	5	4	3	y	10	12	10	9	8	11
x	2	1	3	5	4	3									
y	10	12	10	9	8	11									
Option A:	$Y = 12.4 + 0.8x$														
Option B:	$Y = 12.4 - 1.8x$														
Option C:	$Y = 12.4 - 0.8x$														
Option D:	$Y = 22 - 0.8x$														
Q21.	Obtain Half range cosine series for $f(x) = x(\pi - x)$, in $(0, \pi)$														
Option A:	$X(\pi - x) = \frac{\pi^2}{2} - 4 \sum_{n=odd} \frac{\cos nx}{n^2}$														
Option B:	$X(\pi - x) = \frac{\pi^2}{6} - 4 \sum_{n=even} \frac{\cos nx}{n^2}$														
Option C:	$X(\pi - x) = \frac{\pi^2}{6} - 4 \sum_{n=odd} \frac{\cos nx}{n^2}$														
Option D:	$X(\pi - x) = \frac{\pi^2}{6} + 4 \sum_{n=odd} \frac{\cos nx}{n^2}$														
Q22.	Fit parabola to following data: <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>y</td> <td>2</td> <td>3</td> <td>5</td> <td>6.5</td> <td>7</td> <td>8</td> </tr> </tbody> </table>	x	1	2	3	4	5	6	y	2	3	5	6.5	7	8
x	1	2	3	4	5	6									
y	2	3	5	6.5	7	8									
Option A:	$Y = 0.1 + 1.99x - 0.107x^2$														
Option B:	$Y = -2 + 1.99x - 0.107x^2$														
Option C:	$Y = -0.1 + 1.99x - 0.107x^2$														
Option D:	$Y = -0.1 + 1.99x + 0.107x^2$														
Q23.	Solve by using Laplace transform: $3y' + 2y = e^{3t}$, $y=1$ at $t=0$.														
Option A:	$Y = 10/11 e^{-(2/3)t} - 1/11 e^{3t}$														
Option B:	$Y = 10/11 e^{-(2/3)t} + 1/10 e^{3t}$														

Option C:	$Y = 30 e^{-(2/3)t} + 1/11 e^{3t}$
Option D:	$Y = 10/11 e^{-(2/3)t} + 1/11 e^{3t}$
Q24.	Find orthogonal trajectory: $X^2 - y^2 + x = C$
Option A:	$2xy + y = c$
Option B:	$2xy - y = c$
Option C:	$xy + y = c$
Option D:	$xy - y = c$
Q25.	For two lines of regression $3x + 2y = 26$, $6x + y = 31$, find correlation coefficient between x and y.
Option A:	$r = 0.96$
Option B:	$r = -0.63$
Option C:	$r = -0.5$
Option D:	$r = 0.22$