

## University of Mumbai

Program: (IT)

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: ITC301 and Course Name: Engineering Mathematics III

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Find the Laplace transform of $f(t)$ , $f(t)=a$ , $0 < t < b$ and $f(t)=0$ , $t > b$
Option A:	$\frac{ab}{s}(1 - e^{-bt})$
Option B:	$\frac{b}{s}(1 - e^{-bt})$
Option C:	$\frac{a}{s}(1 - e^{-bt})$
Option D:	$\frac{-a}{s}(1 - e^{-bt})$
2.	Find the Laplace transform of $e^{4t} \cdot \sin^3 t$
Option A:	$\frac{6}{(s^2-8s+17)(s^2-8s+25)}$
Option B:	$\frac{64}{(s^2-8s+17)(s^2-8s+25)}$
Option C:	$\frac{6}{(s^2-8s+17)(s^2-8s+20)}$
Option D:	$\frac{6}{(s^2-7s+17)(s^2-8s+25)}$
3.	Find $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$
Option A:	$\frac{1}{4}(1 - \cos 2t)$
Option B:	$\frac{1}{45}(1 - \sin 2t)$
Option C:	$\frac{1}{4}(1 - \cot 2t)$
Option D:	$\frac{1}{4}(1 - \tan 2t)$
4.	Find the Inverse Laplace transform $\frac{1}{s(s+a)}$
Option A:	$\frac{1-e^{-at}}{ab}$
Option B:	$\frac{1-e^{-at}}{a}$
Option C:	$\frac{1-e^{-t}}{a}$
Option D:	$\frac{1-e^{at}}{a}$
5.	Find the value of an for $x \cos x$ in $(-\pi, \pi)$
Option A:	$1/n$
Option B:	$0$

Option C:	2/n
Option D:	4
6.	<p>Given <math>\sum d_x d_y = 186</math>,</p> <p><math>\sum d_x = 11, \sum d_y = 7, N = 10, \sum d_x^2 = 215, \sum d_y^2 = 163</math> Find the correlation coefficient r.</p>
Option A:	0.99
Option B:	0.88
Option C:	0.77
Option D:	0.55
7.	Construct an analytic function whose real part is $e^x \cos y$
Option A:	$f(z) = \int e^z . dz = e a^z + c$
Option B:	$f(z) = \int e^z . dz = a^z + c$
Option C:	$f(z) = \int e^z . dz = e^{az} + c$
Option D:	$f(z) = \int e^z . dz = e^z + c$
8.	Given $N = 10, \sum d_i^2 = 96$ . Find the rank correlation coefficient R.
Option A:	$R = 0.41$
Option B:	$R = 0.51$
Option C:	$R = 0.25$
Option D:	$R = 0.35$
9.	<p>A Continuous random variable X has the p.d.f <math>f(x) = k x^2, 0 \leq x \leq 2</math></p> <p>Find <math>P(0.2 \leq X \leq 0.5)</math></p>
Option A:	0.243
Option B:	0.0021
Option C:	0.0123
Option D:	0.5632
10.	<p>Find E(X) for the probability density function <math>f(x) =</math></p> <p><math>\{k(x - x^2), 0 \leq x \leq 1\}</math> , elsewhere</p>
Option A:	$\frac{1}{3}$

Option B:	1
Option C:	$\frac{1}{2}$
Option D:	2

<b>Q2</b> <b>(20 Marks Each)</b>	<b>Solve any Four out of Six</b> <span style="float: right;"><b>5 marks each</b></span>																
A	Find the Laplace transform of $\frac{1}{t}e^{-t} \sin t$																
B	Find the inverse Laplace transform of $\frac{1}{\sqrt{2s+1}}$																
C	Show that the function, $v = e^x(x \sin y + y \cos y)$ is a harmonic function. Find its harmonic conjugate.																
D	Find the Fourier series for $f(x)=x$ in $(0,2\pi)$ .																
E	The probability density function of a random variable X has <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>P(X=x)</td> <td>k</td> <td>3k</td> <td>5k</td> <td>7k</td> <td>9k</td> <td>11k</td> <td>13k</td> </tr> </table> Find $P(X < 4)$ $P(3 < X \leq 6)$ .	X	0	1	2	3	4	5	6	P(X=x)	k	3k	5k	7k	9k	11k	13k
X	0	1	2	3	4	5	6										
P(X=x)	k	3k	5k	7k	9k	11k	13k										
F	Calculate the coefficient of correlation <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>2</td> <td>3</td> <td>4</td> <td>7</td> <td>4</td> </tr> <tr> <td>y</td> <td>8</td> <td>7</td> <td>3</td> <td>1</td> <td>1</td> </tr> </table>	x	2	3	4	7	4	y	8	7	3	1	1				
x	2	3	4	7	4												
y	8	7	3	1	1												

<b>Q3</b> <b>(20 Marks Each)</b>	<b>Solve any Four out of Six</b> <span style="float: right;"><b>5 marks each</b></span>																
A	Find the Laplace transform of $\cos t \cos 2t \cos 3t$																
B	Find the inverse Laplace transform of $\frac{s+2}{s^2(s+3)}$																
C	Determine whether the function $f(z) = x^2 - y^2 + 2ixy$ is analytic and if so Find its derivative.																
D	Find half range cosine series for $f(x) = x$ in $(0,2)$ .																
E	Find the equation of line of regression y on x for the following data <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										
F	The probability density function $f(x) = \begin{cases} 2e^{-2x}, & 0 \leq x < \infty \\ 0, & \text{elsewhere} \end{cases}$ Find $P(1 \leq X \leq 3)$ , $P(X \geq 0.5)$																

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<b>Q4</b> <b>(20 Marks Each)</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>																						
A	Find the Laplace transform of $\cos 4t \cos 6t$																							
B	Find the inverse Laplace transform of $\frac{s}{(s^2+9)^2}$																							
C	Determine whether the function $f(z) = x^2 - y^2 + 2ixy$ is analytic and if so Find its derivative.																							
D	Find the Fourier series for $f(x) = e^{- x }$ in $(-\pi, \pi)$ .																							
E	Find the mean and variance of $f(x) = \begin{cases} 1 - x, & 0 < x < 1 \\ x - 1, & 1 < x < 2 \end{cases}$																							
F	Calculate the spearman rank coefficient of correlation																							
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">X</td> <td style="text-align: center;">85</td> <td style="text-align: center;">74</td> <td style="text-align: center;">85</td> <td style="text-align: center;">50</td> <td style="text-align: center;">65</td> <td style="text-align: center;">78</td> <td style="text-align: center;">74</td> <td style="text-align: center;">60</td> <td style="text-align: center;">74</td> <td style="text-align: center;">90</td> </tr> <tr> <td style="text-align: center;">Y</td> <td style="text-align: center;">78</td> <td style="text-align: center;">91</td> <td style="text-align: center;">78</td> <td style="text-align: center;">58</td> <td style="text-align: center;">60</td> <td style="text-align: center;">72</td> <td style="text-align: center;">80</td> <td style="text-align: center;">55</td> <td style="text-align: center;">68</td> <td style="text-align: center;">70</td> </tr> </table>		X	85	74	85	50	65	78	74	60	74	90	Y	78	91	78	58	60	72	80	55	68	70
X	85	74	85	50	65	78	74	60	74	90														
Y	78	91	78	58	60	72	80	55	68	70														