

University of Mumbai

Examination 2020

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Information Technology

Curriculum Scheme: Rev2016

Examination: SE Semester III

Course Code: ITC301 and Course Name: Applied Mathematics-III

Time: 2 hour

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 $4t^2 + \sin 3t + e^{2t}$
Option A:	$\frac{9}{s^3} + \frac{3}{s^2 + 3^2} + \frac{1}{s - 2}$
Option B:	$\frac{8}{s^3} + \frac{8}{s^2 + 3^2} + \frac{1}{s - 2}$
Option C:	$\frac{8}{s^3} + \frac{3}{s^2 + 3^2} + \frac{4}{s - 2}$
Option D:	$\frac{8}{s^3} + \frac{3}{s^2 + 3^2} + \frac{1}{s - 2}$
3.	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:	$\frac{6}{(s^2 - 7s + 17)(s^2 - 8s + 25)}$
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 $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$												
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:	$\frac{1}{4}(1 - \tan 2t)$												
6.	The equations of the two lines of regression are $5x - y = 22$ and $64x - 45y = 24$. Find x and y .												
Option A:	$x = 6, y = 8$												
Option B:	$x = 3, y = 8$												
Option C:	$x = 4, y = 8$												
Option D:	$x = 6, y = 5$												
7.	Given $N = 5, \sum d_i^2 = 8$. Find the rank correlation coefficient R .												
Option A:	$R = 0.6$												
Option B:	$R = 0.5$												
Option C:	$R = 0.4$												
Option D:	$R = 0.3$												
8.	Given $\sum d_x d_y = 186, \sum d_x = 11, \sum d_y = 7, N = 10, \sum d_x^2 = 215, \sum d_y^2 = 163$ Find the correlation coefficient r .												
Option A:	0.99												
Option B:	0.88												
Option C:	0.77												
Option D:	0.55												
9.	Calculate the correlation coefficient for the following data <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>X</td> <td>3</td> <td>5</td> <td>4</td> <td>6</td> <td>2</td> </tr> <tr> <td>Y</td> <td>3</td> <td>4</td> <td>5</td> <td>2</td> <td>6</td> </tr> </tbody> </table>	X	3	5	4	6	2	Y	3	4	5	2	6
X	3	5	4	6	2								
Y	3	4	5	2	6								
Option A:	1												
Option B:	-.5												
Option C:	.7												
Option D:	.9												
10.	A function satisfy the Laplace equation is known as												
Option A:	Analytic function												
Option B:	harmonic												
Option C:	holomorphic												
Option D:	Non holomorphic												

11.	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
12.	In Fourier integral an is zero when function is
Option A:	Even
Option B:	Odd
Option C:	Real
Option D:	Neither even nor odd
13.	If $f(x)$ is odd function then Fourier integral $f(x)$ reduced to
Option A:	Cosine
Option B:	Sine
Option C:	Cosine and sine
Option D:	0
14.	What are periodic signals?
Option A:	The signals which change with time
Option B:	The signals which change with frequency
Option C:	The signal that repeats itself in time
Option D:	The signals that repeat itself over a fixed frequency
15.	Find the Laplace transform of $\sin 5t$
Option A:	$\frac{5}{s^2 + 5^2}$
Option B:	$\frac{s}{s^2 + 5^2}$
Option C:	$\frac{5}{s^2 - 5^2}$
Option D:	$\frac{s}{s^2 - 5^2}$
16.	Construct an analytic function whose real part is $e^x \cos y$
Option A:	$f(z) = \int e^z \cdot dz = ea^z + c$
Option B:	$f(z) = \int e^z \cdot dz = a^z + c$
Option C:	$f(z) = \int e^z \cdot dz = e^{az} + c$
Option D:	$f(z) = \int e^z \cdot dz = e^z + c$
17.	Construct an analytic function whose imaginary part is $e^{-x}(y \cos y - x \sin y)$
Option A:	$z e^{-z} + c$
Option B:	$z e^z + c$
Option C:	$z e^{az} + c$
Option D:	$z e^{bz} + c$

18.	Construct an analytic function whose imaginary part is $\frac{y}{x}$
Option A:	$\tan z + c$
Option B:	$\sec z + c$
Option C:	$e^x z + c$
Option D:	$\log z + c$
19.	Construct an analytic function whose real part is $x^4 - 6x^2y^2 + y^4$
Option A:	$z^4 + c$
Option B:	$ez^4 + c$
Option C:	$e^4 + c$
Option D:	$x^4 + c$
20.	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:	$R = 0.35$

Q2 (20 Marks)	Solve any Four out of Six	5 marks each																
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, $f(z) = \sinh z$ is analytic and find $f'(z)$ in terms of z.																	
D	Find the Fourier series for $f(x) = x$ in $(0, 2\pi)$.																	
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>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> </tr> <tr> <td>y</td> <td>11</td> <td>14</td> <td>14</td> <td>15</td> <td>12</td> <td>17</td> <td>16</td> </tr> </table>	x	5	6	7	8	9	10	11	y	11	14	14	15	12	17	16	
x	5	6	7	8	9	10	11											
y	11	14	14	15	12	17	16											
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													

Q3 (20 Marks)	Solve any Four out of Six	5 marks each
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 the Fourier series for $f(x) = e^{- x }$ in $(-\pi, \pi)$.	

E	Find the equation of line of regression y on x for the following data <table border="1" data-bbox="379 235 1268 353"> <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								
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Y	19	22	24	27	29	33	37																									
F	Calculate the spearman rank coefficient of correlation <table border="1" data-bbox="375 441 1252 544"> <tr> <td>X</td> <td>85</td> <td>74</td> <td>85</td> <td>50</td> <td>65</td> <td>78</td> <td>74</td> <td>60</td> <td>74</td> <td>90</td> </tr> <tr> <td>Y</td> <td>78</td> <td>91</td> <td>78</td> <td>58</td> <td>60</td> <td>72</td> <td>80</td> <td>55</td> <td>68</td> <td>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																						
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