

# University of Mumbai

## Examination 2020

Program: Information Technology

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: \_\_\_\_\_ and Course Name: Engineering Mathematics

Time: 2 hour

Max. Marks: 80

<b>Q1.</b>	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
<b>1.</b>	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:	$\frac{-a}{s}(1 - e^{-bt})$
<b>2.</b>	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:	$\frac{8}{s^3} + \frac{3}{s^2 + 3^2} + \frac{1}{s - 2}$
<b>3.</b>	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:	$\frac{6}{(s^2 - 7s + 17)(s^2 - 8s + 25)}$
<b>4.</b>	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;"> <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> </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 $n$ for $x \cos x$ in $(-\pi, \pi)$												
Option A:	1/n												

<b>Option B:</b>	<b>0</b>
<b>Option C:</b>	<b>2/n</b>
<b>Option D:</b>	<b>4</b>
<b>12.</b>	<b>In Fourier integral an is zero when function is</b>
<b>Option A:</b>	<b>Even</b>
<b>Option B:</b>	<b>Odd</b>
<b>Option C:</b>	<b>Real</b>
<b>Option D:</b>	<b>Neither even nor odd</b>
<b>13.</b>	<b>If f(x) is odd function then Fourier integral f(x) reduced to</b>
<b>Option A:</b>	<b>Cosine</b>
<b>Option B:</b>	<b>Sine</b>
<b>Option C:</b>	<b>Cosine and sine</b>
<b>Option D:</b>	<b>0</b>
<b>14.</b>	<b>What are periodic signals?</b>
<b>Option A:</b>	<b>The signals which change with time</b>
<b>Option B:</b>	<b>The signals which change with frequency</b>
<b>Option C:</b>	<b>The signal that repeats itself in time</b>
<b>Option D:</b>	<b>The signals that repeat itself over a fixed frequency</b>
<b>15.</b>	<b>Find the Laplace transform of <math>\sin 5t</math></b>
<b>Option A:</b>	$\frac{5}{s^2 + 5^2}$
<b>Option B:</b>	$\frac{s}{s^2 + 5^2}$
<b>Option C:</b>	$\frac{5}{s^2 - 5^2}$
<b>Option D:</b>	$\frac{s}{s^2 - 5^2}$
<b>16.</b>	<b>Construct an analytic function whose real part is <math>e^x \cos y</math></b>
<b>Option A:</b>	$f(z) = \int e^z . dz = ea^z + c$
<b>Option B:</b>	$f(z) = \int e^z . dz = a^z + c$
<b>Option C:</b>	$f(z) = \int e^z . dz = e^{az} + c$
<b>Option D:</b>	$f(z) = \int e^z . dz = e^z + c$
<b>17.</b>	<b>Construct an analytic function whose imaginary part is <math>e^{-x}(y \cos y - x \sin y)</math></b>
<b>Option A:</b>	$z e^{z^2} + c$
<b>Option B:</b>	$z e^z + c$
<b>Option C:</b>	$z e^{az} + c$
<b>Option D:</b>	$z e^{bz} + c$
<b>18.</b>	<b>Construct an analytic function whose imaginary part is <math>\tan^{-1} \frac{y}{x}</math></b>
<b>Option A:</b>	$\tan z + c$
<b>Option B:</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:	<b>R = 0.41</b>
Option B:	$R = 0.51$
Option C:	$R = 0.25$
Option D:	$R = 0.35$

<b>Q2</b> (20 Marks)	<b>Solve any Four out of Six</b>	<b>5 marks each</b>																
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													

<b>Q3</b> (20 Marks)	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
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	

	X	10	12	13	16	17	20	25			
	Y	19	22	24	27	29	33	37			
F	Calculate the spearman rank coefficient of correlation										
	X	85	74	85	50	65	78	74	60	74	90
	Y	78	91	78	58	60	72	80	55	68	70