SAMPLE QUESTIO BANK

May 2022

Program: Computer Engineering

Curriculum Scheme: Rev2016

Examination: SE Semester III

Course Code: CSC301 and Course Name: Applied Mathematics III

Multiple Choice Questions

	Choose the correct option for following questions.
1.	Find the inverse Z-transform of $\frac{z}{z^2+7z+10}$
Option A:	$\frac{1}{3}(2)^n - \frac{1}{3}(5)^n$
Option B:	$\frac{1}{3}(-2)^n + \frac{1}{3}(-5)^n$
Option C:	$\frac{1}{3}(2)^n + \frac{1}{3}(5)^n$
Option D:	$\frac{1}{3}(-2)^n - \frac{1}{3}(-5)^n$
2.	Find the mapping of the real axis of the z-plane under the transformation $w = \frac{2}{z+i}$
Option A:	A circle $\|w\| = 1$
Option B:	A circle centered at (0,-1) and radius 1
Option C:	A circle centered at (-1,0) and radius 1
Option D:	A circle centered at (1,1) and radius 1
3.	If $f(x)$ is an even function in the in the interval $(-l, l)$ then in the Fourier series expansion of $f(x)$
Option A:	a_n=0, $b_n = 0$
Option B:	$a_0 = 0, a_n = 0$
Option C:	$b_n = 0$
Option D:	$a_0 = 0, b_n = 0$
4.	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 are harmonic
5.	Find the Laplace transform of $\sin t \ u(t-\pi)$
Option A:	$-\frac{e^{-\pi s}}{s^2+1}$
Option B:	$-\frac{e^{\pi s}}{s^2+1}$

Option C:	$-\frac{e^{-\pi s}}{s^2-1}$
Option D:	$\frac{e^{-\pi s}}{s^2+1}$
6.	If two variables oppose each other then the correlation will be
Option A:	Positive Correlation
Option B:	Zero Correlation
Option C:	Perfect Correlation
Option D:	Negative Correlation
7.	Inverse Laplace Transform of $\frac{1}{(s+1)(s+2)}$
Option A:	$e^{-t}-e^{2t}$
Option B:	$e^{-5t}-e^{-2t}$
Option C:	$e^{-t}+e^{-2t}$
Option D:	$e^{-t}-e^{-2t}$
8.	Find the Laplace transform of $\cosh at \cos at$.
Option A:	$\frac{1}{2}\left[\frac{s-a}{(s-a)^2-a^2}+\frac{s+a}{(s+a)^2+a^2}\right]$
Option B:	$\frac{1}{2}\left[\frac{s-a}{(s-a)^2+a^2}+\frac{s+a}{(s+a)^2-a^2}\right]$
Option C:	$\frac{1}{2}\left[\frac{s-a}{(s-a)^2+a^2}+\frac{s+a}{(s+a)^2+a^2}\right]$
Option D:	$\frac{1}{2}\left[\frac{s-a}{(s-a)^2+a^2}-\frac{s+a}{(s+a)^2-a^2}\right]$
9.	For the given data if $b_{yx}<1$ then b_{xy} is
Option A:	>1
Option B:	<1
Option C:	$=1$
Option D:	$=0$
10.	In the Fourier series expansion of $f(x)=e^{\alpha x}, \alpha \neq 0$ in $(0,2\pi)$ what is the value of b_5
Option A:	$\frac{5(1-e^{-2\pi\alpha})}{\pi(\alpha^2+25)}$
Option B:	$\frac{5(1+e^{2\pi\alpha})}{\pi(\alpha^2+25)}$
Option C:	$\frac{5(1-e^{2\pi\alpha})}{\pi(\alpha^2+25)}$
Option D:	$\frac{(1-e^{-2\pi\alpha})}{5\pi(\alpha^2+25)}$
11.	The fixed points of the bilinear transformation $w=\frac{2(z-1)}{(1+i)z-2}$ are
Option A:	both imaginary numbers
Option B:	both real irrational numbers

Option C:	both real and equal numbers
Option D:	both real rational numbers
12.	Spearman's rank correlation coefficient for the data: Rank in Maths: 1, 3, 7, 5, 4, 6, 2, 10, 9, 8 Rank in Stats: 3, 1, 4, 5, 6, 9, 7, 8, 10, 2 is equal to
Option A:	0.4118
Option B:	0.1481
Option C:	0.4181
Option D:	0.1841
13.	The coefficient of $\frac{1}{z^4}$ in the z-transform of a sequence {-6, -3, -1, 0, 2, 4,6, 8, 10} is
Option A:	0
Option B:	6
Option C:	4
Option D:	8
14.	$L\left\{sint\ H(t-\frac{1}{2})\right\}$ =
Option A:	$\frac{\cos\frac{1}{2}-\ s\sin\frac{1}{2}}{s^2+1}\ e^{\frac{-1}{2}s}$
Option B:	$\frac{\cos\frac{1}{2}+\ s\sin\frac{1}{2}}{s^2+1}\ e^{\frac{1}{2}s}$
Option C:	$\frac{\cos\frac{1}{2}-\ s\sin\frac{1}{2}}{s^2+1}\ e^{\frac{1}{2}s}$
Option D:	$\frac{\cos\frac{1}{2}+s\sin\frac{1}{2}}{s^2+1}\ e^{\frac{-1}{2}s}$
15.	In the complex form of Fourier series of f(x) = x , (0, π) the value of C_2 is
Option A:	$\frac{i}{4}$
Option B:	$\frac{i}{2}$
Option C:	$\frac{-i}{2}$
Option D:	i

16.	If f(t) = $L^{-1}\left\{\frac{1}{s^2+2s+5}\right\}$ then f(0) =
Option A:	0
Option B:	1
Option C:	0.5
Option D:	2
17.	The coefficient of cos3t in the Fourier series expansion of f(t)= $3t-2t^3$ in the interval $(-\pi, \pi)$ is
Option A:	$\frac{1}{3}$
Option B:	$\frac{1}{2}$
Option C:	0
Option D:	1
18.	$L^{-1}\left\{\frac{1}{s(s-1)^2}\right\}$ is
Option A:	$te^t + e^t + 1$
Option B:	$te^t - e^t - 1$
Option C:	$te^t + e^t - 1$
Option D:	$te^t - e^t + 1$
19.	The image of the interior part unit circle in z-plane onto the w- plane under the transformation w= $\frac{i-z}{z+i}$ is
Option A:	Entire half of the w- plane to the right of imaginary axis
Option B:	Entire half of the w- plane to the left of imaginary axis
Option C:	Exterior part of the unit circle in w-plane
Option D:	Interior part of the unit circle in w-plane
20.	Evaluate using Laplace transform: $\int_0^\infty e^{-t} \int_0^t e^{-2u}cos^2u\, du\, dt$
Option A:	$\frac{7}{15}$
Option B:	$\frac{11}{39}$
Option C:	$\frac{-2}{39}$
Option D:	$\frac{2}{15}$
Descriptive Question	

<table>
<tr><td>1</td><td>Evaluate the Fourier coefficients a_0 and a_n of $f(x) = \frac{1}{2}(\pi - x)$ in $(0, 2\pi)$.</td></tr>
<tr><td>2</td><td>Evaluate $\int_0^\infty e^{-2t}\,\frac{sinht}{t}\,dt$ using Laplace Transform.</td></tr>
<tr><td>3</td><td>Fit a straight line to the following data, with x as independent variable
<table>
<tr><td>x</td><td>1965</td><td>1966</td><td>1967</td><td>1968</td><td>1969</td></tr>
<tr><td>y</td><td>125</td><td>140</td><td>1651</td><td>195</td><td>200</td></tr>
</table></td></tr>
<tr><td>4</td><td>Find $L^{-1}\left(\log\left(1+\frac{a}{s}\right)\right)$</td></tr>
<tr><td>5</td><td>Find the harmonic conjugate of $x^4 - 6x^2y^2 + y^4$.</td></tr>
<tr><td>6</td><td>Find the inverse z transform of $Z^{-1}\left\{\frac{1}{z-1}\right\}$, $|z| < 1$.</td></tr>
<tr><td>7</td><td>Find Laplace transform of L{ f(t) }
where f(t) =t , 0< t <1 and f(t) is periodic function with period 1.</td></tr>
<tr><td>8</td><td>Obtain Fourier series for f(x) = 16 – x^2 in (-1,1).</td></tr>
<tr><td>9</td><td>Show that u= e^x cosy-x^2+y^2 is harmonic and find the corresponding analytic function f(z)= u+iv</td></tr>
<tr><td>10</td><td>Find the equations of two regression lines using the following data:
$\bar{x} = 23, \bar{y} = 35, \sigma_x = 2, \sigma_y = 3, r_{xy} = 0.6$
Also estimate y when x= 20 and x when y= 38</td></tr>
<tr><td>11</td><td>Find $L^{-1}\left\{\frac{s+3}{(s^2+6s+13)^2}\right\}$ using convolution theorem</td></tr>
<tr><td>12</td><td>Find Z –transform of f(k) = $\frac{3^k}{k!}$, k > 0</td></tr>
<tr><td>13</td><td>Show that the function, $f(z) = sinhz$ is analytic and find $f'(z)$ in terms of z.</td></tr>
<tr><td>14</td><td>Find $L(t\,e^{-3t}\,cos2t\,cos3t)$</td></tr>
<tr><td>15</td><td>Find the Z-transform of $\left\{\left(\frac{1}{3}\right)^{|k|}\right\}$</td></tr>
<tr><td>16</td><td>Calculate Spearman’s coefficient of rank correlation from the following data of students
<table>
<tr><td>Height (in inches.)</td><td>60</td><td>62</td><td>64</td><td>66</td><td>68</td><td>70</td><td>72</td><td>74</td></tr>
<tr><td>Weight (in lbs.</td><td>92</td><td>83</td><td>101</td><td>110</td><td>128</td><td>119</td><td>137</td><td>146</td></tr>
</table></td></tr>
<tr><td>17</td><td>Evaluate the Fourier coefficients a_0 and b_3 of $f(x) = x$ in $(0, 2\pi)$.</td></tr>
<tr><td>18</td><td>Find inverse Laplace Transform of
$\frac{1}{s^3(s-5)}$ using convolution theorem.</td></tr>
<tr><td>19</td><td>Using Laplace Transform evaluate the following integral
$\int_0^\infty e^{-2t}\,\frac{sin3t\,cos2t}{t}\,dt$</td></tr>
<tr><td>20</td><td>Prove that the set 1, sinx, cosx, sin2x, cos2x, sin3x, …. is orthogonal on (0, 2π).</td></tr>
<tr><td>21</td><td></td></tr>
</table>

	If f(z)= $a^2x^2y-c^2y^3+2x^2-2y^2+i(b^2xy-x^3+3xy^2)$ is analytic , find the possible values of unknown constants a, b, and c.
22	Find the Karl-Pearson's coefficient of correlation for the following data: X: 120, 125, 127, 130, 134, 137 Y: 42, 47, 48, 46, 50, 49
23	Solve using Laplace transform: $(D^2+2D-3)\,y = \sin t$, where $D=\frac{d}{dt}$ given : $y(0) = 0$, $y'(0) = 0$
24	Find $Z^{-1}\left\{\frac{1}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{3}\right)}\right\}, \lvert z\rvert > \frac{1}{2}$
25	Find $L(1+2t-3t^2+4t^3)\,H(t-2)$
26	Determine the constants a, b, c, d if $f(z) = x^2 + 2axy + by^2 + i(cx^2 + 2dxy + y^2)$ is analytic.
27	Obtain the half range cosine series expansion of $f(x) = x(\pi - x), 0 < x < \pi$.
28	Fit a straight line to the following data Year x: 1951, 1961, 1971, 1981, 1991 Production y: 10, 12, 8, 10, 15
29	Find the inverse Z-transform of $\frac{4z}{z-a}$ for $\lvert z\rvert > \lvert a\rvert$.
30	Evaluate inverse Laplace Transform of $\log\left(1+\frac{1}{s^2}\right)$.
31	Find Laplace transform of $L\{t^2\cos t\}$
32	Find half range sine series for the function f(x) = $\begin{cases} \left(\frac{1}{4}\right) - x, & 0 < x < \left(\frac{1}{2}\right) \\ x - \left(\frac{3}{4}\right), & \left(\frac{1}{2}\right) < x < 1 \end{cases}$
33	Find the image of the infinite strip $\frac{1}{6} \le y < \frac{1}{4}$ under the transformation w= $\frac{1}{z}$. Show the regions graphically.
34	The equations of the two regression lines are 3x +2y = 26 and 6x + y =31 Find i)Means of x and y, ii) r, and iii)σ_y *when* $\sigma_x = 3$
35	Find $L^{-1}\left\{\frac{1}{s^3(s+3)^2}\right\}$ using partial fraction method.
36	Find Z –transform of f(k) = $\cos\left(\frac{k\pi}{7} - \alpha\right)$, $k \ge 0$.