University of Mumbai

Examination 2021 under cluster __ (Lead College: _____)

Examinations Commencing from 1st June 2021 to 10th June 2021

Program: **BE(Instrumentation Engineering)**

Curriculum Scheme: Rev2016

Examination: SE Semester IV

Course Code: ISC401 and Course Name: Applied Mathematics-IV

Time: 2-hour Max. Marks: 80

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is the value of $\int_0^{2\pi} \frac{cos2\theta}{5+4cos\theta} d\theta$
Option A:	$\frac{\pi}{4}$
Option B:	$\frac{\pi}{5}$
Option C:	$\frac{\pi}{6}$
Option D:	$\frac{\pi}{7}$
2.	What is the value of $\int_c \frac{2(3z^2+z)}{(z-1)(z+1)} dz$ where c is circle $\|z\| = 2$
Option A:	$2\pi i$
Option B:	$4\pi i$
Option C:	πi
Option D:	π
3.	If x, y are independent variables then they are _____
Option A:	Related
Option B:	Correlated
Option C:	Not correlated
Option D:	Semi related
4.	What is the value of $\int_c \frac{z+2}{(z-3)(z-4)} dz$, where c is circle $\|z\| = 1$.
Option A:	0
Option B:	1
Option C:	2
Option D:	3
5.	The equation of the line of regression of Y on X is ___
Option A:	$Y - \bar{Y} = b_{yx}(X - \bar{X})$
Option B:	$Y - \bar{Y} = b_{yx}(X + \bar{X})$
Option C:	$Y + \bar{Y} = b_{yx}(X - \bar{X})$
Option D:	$Y - \bar{Y} = b_{xy}(X - \bar{X})$
6.	Binomial Distribution is a _____
Option A:	Continuous distribution
Option B:	Discrete distribution

Option C:	Irregular distribution
Option D:	Not a Probability distribution
7.	Total area under the curve of a continuous probability density function· is always equal to:
Option A:	0
Option B:	-1
Option C:	1
Option D:	2
8.	If 'm' is the mean of Poisson Distribution, the P (0) is given by _____
Option A:	e^{-m}
Option B:	e^{m}
Option C:	E
Option D:	m^{-e}
9.	If $f(z)$ is analytic in and on closed contour C then $\oint_C f(z)dz =$ ____
Option A:	1
Option B:	-1
Option C:	2
Option D:	0
10.	If $\lambda_1$and λ_2 are eigen values of square matris A of order two then det(A) =____
Option A:	$\lambda_1 + \lambda_2$
Option B:	$\lambda_1 . \lambda_2$
Option C:	$\lambda_1 - \lambda_2$
Option D:	$\lambda_1 + 2\lambda_2$
11.	Let A be a 3×3 matrix with real entries such that det(A)=6 and the trace of A is 0. If det(A+I) = 0, where I denote the 3×3 identity matrix, then the eigen values of A are
Option A:	-1,2,3
Option B:	-1, 2, -3
Option C:	1, 2, -3
Option D:	-1, -2, 3
12.	In a Binomial Distribution, if 'n' is the number of trials and 'p' is the probability of success, then the mean value is given by
Option A:	n.p
Option B:	n.p.q
Option C:	$n.p^2q$
Option D:	$n.p.q^2$
13.	If $A = \begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix}$ then minimal polynomial $f(x)$ of A is _____
Option A:	$x^2 - 3x - 2$
Option B:	$x^2 + 3x + 2$
Option C:	$x^2 - 3x + 2$
Option D:	$x^2 - 3x + 22$
14.	The probability function of a random variable is defined as:

	<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>P(x)</td><td>k</td><td>2k</td><td>3k</td><td>4k</td><td>5k</td></tr></table> Then what is the value of k
Option A:	$\frac{1}{14}$
Option B:	$\frac{1}{15}$
Option C:	$\frac{1}{16}$
Option D:	$\frac{1}{17}$
15.	If X is a random variable with PDF $f(x)$ then $\int_{-\infty}^{\infty} xf(x)dx$ is equal to
Option A:	Variance
Option B:	Standard deviation
Option C:	Mean
Option D:	Mode
16.	If $v = (1 \quad 3 \quad -1)$ then $\|v\| =$?
Option A:	$\sqrt{12}$
Option B:	$\sqrt{11}$
Option C:	$\sqrt{13}$
Option D:	$\sqrt{14}$
17.	The determinant of 3×3 matrix $\begin{bmatrix} 100 & 200 & 300 \\ 0 & 2 & 400 \\ 0 & 0 & -1 \end{bmatrix}$ is ____
Option A:	100
Option B:	200
Option C:	-100
Option D:	-200
18.	If W_1 and W_2 are subspaces of vector space V then which of the following is always subspace of V?
Option A:	$W_1 \cap W_2$
Option B:	$W_1 \cup W_2$
Option C:	$W_1 - W_2$
Option D:	W_1^c
19.	Which of the following is not possible in probability distribution?
Option A:	$p(x) \geq 0$
Option B:	$\sum p(x) = 1$
Option C:	$\sum xp(x) = 2$
Option D:	$p(x) = -0.5$
20.	If $u, v, w \in V$ $(vectorspace)$ and $u + w = v + w$ then $u =$ ____
Option A:	v
Option B:	w
Option C:	1
Option D:	0

<table>
<tr><th>Q2</th><th>Solve any Four out of Six 5 marks each</th></tr>
<tr><td>A</td><td>Let u and v be orthogonal vectors. If u + v and u − v are orthogonal, show that $|u| = |v|$.</td></tr>
<tr><td>B</td><td>Determine whether the matrix $A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ is derogatory.</td></tr>
<tr><td>C</td><td>A random variable X has following probability function
<table>
<tr><td>X</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>P (X= x)</td><td>k</td><td>2k</td><td>3k</td><td>k^2</td><td>k^2+k</td><td>$2k^2$</td><td>$4k^2$</td></tr>
</table>
Find i) k ii) P ($X \geq 2$) iii) P ($X < 5$) iv) P ($0 \leq X \leq 5$)</td></tr>
<tr><td>D</td><td>Find the Binomial Distribution if the mean is 4 and variance is 3.</td></tr>
<tr><td>E</td><td>Evaluate $\int_C \frac{zdz}{(z-2)(z-1)^2}$ Where C is the circle $|z-2| = 0.5$</td></tr>
<tr><td>F</td><td>Calculate the correlation coefficient from the following data.
<table>
<tr><td>X:</td><td>23</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>33</td><td>35</td><td>36</td><td>39</td></tr>
<tr><td>Y:</td><td>18</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>28</td><td>29</td><td>30</td><td>32</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Q3</th><th>Solve any Four out of Six 5 marks each</th></tr>
<tr><td>A</td><td>Apply Gram-Schmidt orthogonalization process to the following sequence of vectors in R^3, $u = (1\ 2\ 0), v = (8\ \ 1\ -6), w = (0\ 0\ 1)$.</td></tr>
<tr><td>B</td><td>If $A = \begin{bmatrix} \pi & \pi/4 \\ 0 & \pi/2 \end{bmatrix}$ then find $cosA$.</td></tr>
<tr><td>C</td><td>A continuous random variable X has the probability density function
$$f(x) = \begin{cases} kx & ;\ 0 \leq x \leq 2 \\ 2x & ;\ 2 \leq x \leq 4 \\ 6k - kx & ;\ 4 \leq x \leq 6 \end{cases}$$
Then find I) k II) P ($1 \leq x \leq 3$) III) mean.</td></tr>
<tr><td>D</td><td>In a Poisson distribution P(x=3) is 2/3 times P(x=4). Find the mean and standard deviation.</td></tr>
<tr><td>E</td><td>Evaluate $\int_C \frac{z^2 dz}{(z-2)(z-1)^2}$ Where C is the circle $|z| = 2.5$</td></tr>
<tr><td>F</td><td>Find the equations of the lines of regression for the following data.
<table>
<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></td></tr>
</table>