University of Mumbai

Examination 2021 under cluster 9 (FAMT)

Examinations Commencing from 1st June 2021

Program: **BE(MECHANICAL)**

Curriculum Scheme: Rev2019 'C' Scheme

Examination: SE Semester IV

Course Code: **MEC401** and Course Name:**Engineering Mathematics-4**

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Find the value of a if $\bar{F} = (x - 2z)i + (y - 5x)j + (az + 2x)k$ is solenoidal
Option A:	$a = 2$
Option B:	$a = -2$
Option C:	$a = -4$
Option D:	$a = 4$
2.	Vector field is Irrotational if
Option A:	$\nabla \times \vec{f} = 0$
Option B:	$\nabla . \vec{f} = 0$
Option C:	$\nabla \times \vec{f} \neq 0$
Option D:	$\nabla . \vec{f} = 1$
3.	The residue at the pole z =-1 of $f(z) = \frac{1}{(z+1)(z-2)^2}$is
Option A:	1/3
Option B:	-1/3
Option C:	1/9
Option D:	-1/9
4.	The poles of $f(z) = \frac{3z-1}{(z+1)(z-2)}$ are
Option A:	1,-2
Option B:	-1,-2
Option C:	-1,2
Option D:	1,2
5.	Value of $\int_c \frac{sin2z\ dz}{(z+\pi/3)^4} dz$is where C:$\lvert z\rvert = 2$
Option A:	$4\pi i/3$
Option B:	$\pi i/3$
Option C:	$2\pi i/3$
Option D:	$4\pi i$
6.	$The\ value\ of\ \int_0^{1+i} \bar{z}\ dz$ along straight line y=x is
Option A:	0
Option B:	2

Option C:	3
Option D:	1
7.	If the two regression coefficient are -8/15 and -5/6 then the correlation coefficient is
Option A:	0.667
Option B:	-0.507
Option C:	-0.667
Option D:	0.607
8.	Line of regression y on x is 8x-10y +66 =0. Line of regression x on y is 40x -18y -214 =0. The value of variance of y is 16. The standard deviation of x is
Option A:	3
Option B:	2
Option C:	6
Option D:	7
9.	$\sum xy = 2638, \bar{x} = 14, \bar{y}$ =17, n=10 then cov (x,y) is
Option A:	24.2
Option B:	25.8
Option C:	23.9
Option D:	20.5
10.	Least square fit for the straight line y= ax + b to the data x | 1 | 2 | 3 y | 5 | 7 | 9
Option A:	y = 2x +4
Option B:	y = 2x -3
Option C:	y = 2x +3
Option D:	y = 3x -4
11.	A random variable X has the following probability distribution. The value of K is x | 2 | 3 | 4 | 5 P(x) | 5/K | 7/K | 9/K | 11/K
Option A:	16
Option B:	8
Option C:	48
Option D:	32
12.	In Poisson distribution if n = 100, p = 0.01, then the value of P(r = 0)
Option A:	1/e
Option B:	2/e
Option C:	3/e
Option D:	1/4e
13.	A continuous random variable X has pdf f(x) = kx; $0 \leq x \leq 1$ and k; $1 \leq x \leq 2$ .then the value of k
Option A:	2
Option B:	2/3

Option C:	3/2
Option D:	3
14.	If random variable X takes the values of x=1,2,3 with corresponding Probabilities 1/6, 2/3 1/6 then E(x) is
Option A:	1
Option B:	3
Option C:	4
Option D:	2
15.	Number of road accident on a highway during a month follows a Poisson distribution with mean 2. Probability that in certain month number of accidents in the highway will be equal to 2 is
Option A:	0.354
Option B:	0.2707
Option C:	0.435
Option D:	0.521
16.	In a normal distribution when mean is 1 and S.D =3 then for the intervals $-1.43 \leq x \leq 6.19$ (for z = -0.81, A= 0.2910, for z =1.73 ,A = 0.4582)
Option A:	0.7492
Option B:	0.4582
Option C:	0.2910
Option D:	0.1672
17.	X is normally distributed $\mu = 15,\ \sigma^2 = 9$. Given that for z=1, A=0.3413 $P(X \geq 18)$ is given by
Option A:	0.1587
Option B:	0.4231
Option C:	0.2231
Option D:	0.3413
18.	In normal distribution. The area under standard normal curve to the right of y axis is
Option A:	1
Option B:	0
Option C:	0.5
Option D:	0.6
19.	If observed frequencies are 5,10,15 and expected frequencies are each equal to 10 then chi square value is
Option A:	20
Option B:	10
Option C:	15
Option D:	5
20.	Among 64 offspring of a certain cross between guinea pig 34 were red,10 were black and 20 were white, According to genetic model these number should in the ratio 9:3:4. Expected frequencies in the order
Option A:	36,12,16
Option B:	12,36,16
Option C:	20,12,16

Option D:	36,12,35

Q2	**Solve any Four out of Six** **5 marks each**
A	*Evaluate by Green's theorem for the field* $\vec{F} = x^2\hat{i} + xy\hat{j}$ *over the region R enclosed by* y=x^2 and line y=x
B	Evaluate $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$; c *is* $\|z\| = 3$
C	Determine the coefficient of correlation between X & Y from the following data

X	51	54	56	59	65	60	70
Y	38	44	33	36	33	23	13

D	There is working women's hostel in a town where 75 % are from neighboring town, the rest all are from same town. 48% of women who hail from same town are graduates and 83 % of the women who have come from neighboring town are also graduates. Find the probability that a woman selected at a random is graduates from the same town.
E	In a certain examination test 2000 students appeared in a subject of statistics. Average marks obtained were 50% with standard deviation 5%. How many students do you expect to obtain more than 60% of marks, supposing that marks are distributed normally? (For z =2, A =0.4772)
F	The following table gives the number of accidents in a district during a week. Apply chi-square test to find whether the accidents are uniformly distributed over the week.

Day	Sun	Mon	Tues	Wed	Thu	Fri	Sat
No.of accidents	13	12	11	9	15	10	14

($Table\ value\ of\ \chi^2 = 12.59, d.f = 6, level\ of\ significance = 5\%$)

<table>
<tr><td>Q3</td><td>Solve any Four out of Six 5 marks each</td></tr>
<tr><td>A</td><td>Evaluate using Stokes theorem $\iint_s (\nabla \times \bar{f}).\hat{n}\, d\, s$ where s is curve surface of the paraboloid $x^2 + y^2 = 2z$ bounded by the plane z=2 where $\vec{f} = 3(x-y)\hat{i} + 2xz\hat{j} + xy\hat{k}$</td></tr>
<tr><td>B</td><td>Obtain Laurent's series expansions of f(x) = $\frac{z-1}{z^2-2z-3}$; $|z| > 3$</td></tr>
<tr><td>C</td><td>Calculate the Spearman's rank correlation coefficient for the following data.
<table>
<tr><td>x</td><td>32</td><td>55</td><td>49</td><td>60</td><td>43</td><td>37</td><td>43</td><td>49</td><td>10</td><td>20</td></tr>
<tr><td>y</td><td>40</td><td>30</td><td>70</td><td>20</td><td>30</td><td>50</td><td>72</td><td>60</td><td>45</td><td>25</td></tr>
</table></td></tr>
<tr><td>D</td><td>A C.R.V X has the following pdf. $f(x) = k(x - x^2); 0 \le x \le 1$ Find K and mean</td></tr>
<tr><td>E</td><td>Ten individuals are chosen at random from a population & their height are found to be (inches): 63,63,64,65,66,69,69,70,70 &71. In the light of the data, discuss the suggestion that the mean height in the population is 66 inches. (Table value of t_α=2.6, d.f =9, $level\ of\ significance = 5\%$))</td></tr>
<tr><td>F</td><td>Standard deviation of two samples of size 9 & 13 were found to be 12.15 & 11.85. Can it be concluded that the samples were drawn from the normal population with the same standard deviation? (Given $F_{0.025} = 3.51\ for\ d.o.f.8\&\ 12$ &$F_{0.025} = 4.20\ for\ d.o.f.12\&\ 8$)</td></tr>
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