Examinations Summer 2022

Program: CHEMICAL Engineering

Curriculum Scheme: Rev2019 ©

Examination: **SecondYear (SE)**, Semester-**IV**

Course Code: CHC401 and Course Name: Engineering Mathematics-IV

Time: 2hour 30 minutes 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.	If $\vec{f}$ is a vector point function such that $\nabla.\vec{f} = 0$ then $\vec{f}$ is called as
Option A:	Non – Solenoidal
Option B:	Solenoidal
Option C:	Irrotational
Option D:	Rotational
2.	Range of Spearman's Rank correlation coefficient is
Option A:	$R > 1$
Option B:	$R\ can\ take\ any\ real\ value$
Option C:	$-1 \leq R \leq 1$
Option D:	$R < -2$
3.	The distance between z_0 and the nearest singularity of $f(z)$ is called as
Option A:	Radius of Convergence
Option B:	Circle of Convergence
Option C:	Singular Point
Option D:	Circle of Convergence
4.	A random variable X has probability distribution X: 1 2 3 4 5 6 P(X=x): 5k 3k 2k 7k 5k 12k The value of the k is
Option A:	$\frac{1}{34}$
Option B:	$-\frac{1}{34}$
Option C:	$\frac{13}{34}$
Option D:	$\frac{2}{34}$
5.	The Sample size $n \geq 30$ (for any population) Population Standard Deviation is known then which test should be used
Option A:	$t - test$
Option B:	$Z - test$
Option C:	$Chi - test$
Option D:	$f - test$
6.	The Sample size $n \leq 30$ (for any population) Population Standard Deviation is unknown then which test should be used
Option A:	$t - test$
Option B:	$Z - test$
Option C:	$Ki\ square - test$
Option D:	$f - test$

7.	If Contingency table has r rows and $c$columns the degrees of freedom is given by
Option A:	$d.f. = (r-1) \times (c-1)$
Option B:	$d.f. = (r-2) \times (c-1)$
Option C:	$d.f. = (r-3) \times (c-3)$
Option D:	$d.f. = (r-1) \times (c-2)$
8.	If calculated value of $Ki\ square\ -test$ is greater than the table value the hypothesis is
Option A:	Accepted
Option B:	Standard Deviation known
Option C:	Standard Deviation unknown
Option D:	Rejected
9.	The regression lines of a sample are given by$x + 6y = 6, 3x + 2y = 10$ find $\bar{x}\ and\ \bar{y}$
Option A:	$\bar{x} = 3\ and\ \bar{y} = {}^{1}/_{2}$
Option B:	$\bar{x} = 50\ and\ \bar{y} = 50$
Option C:	$\bar{x} = 30\ and\ \bar{y} = 40$
Option D:	$\bar{x} = 30\ and\ \bar{y} = 45$
10.	Find $E(X)$ if X has the following Probability Density Function $f(x) = \frac{4}{3}x(x-2), 0 \le x \le 2$
Option A:	$E(X) = 2$
Option B:	$E(X) = 4$
Option C:	$E(X) = 1$
Option D:	$E(X) = 3$

Q2	**Solve any Four out of Six5 marks each(4 x 5 = 20)**
A	If $\emptyset = x^3 + y^3 + z^3 - 3xyz$ find $div\ \bar{F}$ and $curl\ \bar{F}$ where $\bar{F} = \nabla\emptyset$
B	Evaluate $\int_0^{1+i}(x^2 + iy)dz$, alongthe path (i) $y = x$, (ii) $y = x^2$, is the line integral independent of path?
C	Calculate Karl Pearson's coefficient of Correlation for the following bivariate series. X: 23, 27, 28, 29, 30, 31, 33, 35, 36, 39 Y: 18, 22, 23, 24, 25, 26, 28, 29, 30, 32
D	There are 11 tickets in a box bearing numbers 1 to 11. Three tickets are drawn one after the other without replacement. Find the probability that they are drawn in the order bearing (i) even, odd, even number, (ii) odd, odd, even number.
E	Fit a Poisson distribution to the following data x: 0, 1, 2, 3, 4 y: 123, 69, 14, 3, 1
F	The 300 digits were chosen at random from a table of random numbers. The frequency of digits was as follows Digit: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, Total Frequency: 28, 29, 33, 31, 26, 35, 32, 30, 31, 25, 300 Using $Ki\ square\ -test$ examine the hypothesis that the digits were distributed in equal numbers in the table

Q3	**Solve any Four out of Six 5 marks each** **(4 x 5 = 20)**
A	Find the total work done in moving a particle in the force field $\bar{F} = 3xyi - 5zj + 10xk$ along $x = t^2 + 1, y = 2t^2, z = t^3$ from $t = 1\ to\ t = 2$
B	Evaluate $\oint_c \frac{\sin \pi z^2 + cos\pi\ z^2}{(z-2)(z-1)} dz$ where C is the circle $\|z\| = 4$.
C	Calculate Spearman's coefficient of rank Correlation form the data on height and weight of eights students. X: 53, 98, 95, 81, 75, 61, 59, 55 Y: 47, 25, 32, 37, 30, 40, 39, 45
D	Find the normalizing factor, k if the following function is a probability density function $f(x) = k(1 - x^2), 0 < x < 1$ Also find $P(0.1 < x < 0.2) and\ P(x > 0.5)$
E	For a normal variate with mean 2.5 and standard deviation 3.5, find the probability that $(i) 2 \le x \le 4.5,\ (ii) -1.5 \le x \le 5.5$
F	The number of car accidents in a metropolitan city was found to be 20, 17, 6, 7, 15, 8, 5,16 and 14 per month respectively. Use $Ki\ square\ -test$ to cheek whether these frequencies are in agreement with the belief that occurrence of accidents was the same for 10 months period. Test at 5%level of significance.

Q4	**Solve any Four out of Six5 marks each (4 x 5 = 20)**
A	Evaluate by Green's Theorem $\int \bar{F}.dr$ where $\bar{F} = x^2 i - xyj$ over the region of triangle having vertices $A = (0,2), B(2,0)\ and\ C(4,2)$
B	Evaluate the following integral by Cauchy's residue theorem $\int_C \frac{z^2}{(z-1)(z-2)} dz, whre\ c\ is\ the\ circle\ \|z\| = 2.5$.
C	Find the lines of regression for the following data x: 5, 6, 7, 8, 9, 10, 11 y: 11, 14, 14, 15, 12, 17, 16
D	A discrete random variable has the probability density function given below x: -2, -1, 0, 1, 2, 3 y: 0.2, k, 0.1, 2k, 0.1, 2k Find k, Mean and Variance
E	Nine items of a sample had the following values 45, 47, 50, 52, 48, 47, 49, 53, 51 Does the mean of 9 items differ significantly from the assumed population mean 47.5 ?
F	Two batches of 12 animals each are given test of inoculation, One batch was inoculated and the other was not. The number of dead and surviving are given in the following table for both cases. Canthe inoculation be regarded as effective against the disease at 5% level of significance (make Yates correction) Inoculated: Dead 2, Surviving 10, Total 12 Not - Inoculated: Dead 8, Surviving 4, Total 12 Total: Dead 10, Surviving 14, Total 24