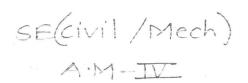
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[3 Hours]

Total Marks: 80

N.B. (1) Question no. 1 is compulsory.

- (2) Attempt any three of the remaining.
- (3) Use of statistical table is allowed.
- (a) Using Green's theorem evaluate.
 ∫ (xy+y²)dx +x²dy where c is the closed curve of the region bounded by y=x and y= x²
 - (b) Use Cayley-Hamilton theorem to find A⁵- $4A^4$ - $7A^3$ + $11A^2$ -A-10 I in terms 5 of A where A= $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$
 - (c) A continuous random variable has probability density function $f(x)=6(x-x^2)$ $0 \le x \le 1$ Find mean and variance.
 - (d) A random sample of 900 items is found to have a mean of 65.3cms. Can it be regarded as a sample from a large population whose mean is 66.2cms. and standard deviation is 5 cms at 5% level of significance.
- 2. (a) Calculate the value of rank correlation coefficient from the following data regarding marks of 6 students in statistics and accountancy in a test

Marks in Statistics:	40	42	45	35	36	39
Marks in Accountancy:	46	43	44	39	40	43

- (b) If 10% of bolts produced by a machine are detective. Find the probability that out of 5 bolts selected at random atmost one will be defective.
- (c) Show that the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

is diagonalisable. Find the transforming matrix and the diagonal matrix.

3. (a) In a laboratory experiment two samples gave the following results.

Sample	size	mean	sum of squares of deviations
1 2	10	15	90
	13	14	108

Test the equality of sample variances at 5% level of significance.

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- 3. (b) Find the relative maximum or minimum of the function. $z=x_1^2+x_2^2+x_3^2-6x_1-10x_2-14x_3+103$
 - (c) Prove that $\overline{F} = (y^2 \cos x + z^3)i + (2y \sin x 4)j + (3xz^2 + 2)k$ is a conservative field. Find the scalar potential for \overline{F} and the workdone in moving an object in this field from (0, 1, -1) to $(\frac{\pi}{2}, -1, 2)$
- 4. (a) The weights of 4000 students are found to be normally distributed with mean 50kgs. and standard deviation 5kgs. Find the probability that a student selected at random will have weight (i) less than 45 kgs.
 - (ii) between 45 and 60 kgs.
 - (b) Use Gauss's Devergence theorem to evaluate $\iint_{s} \overline{N} \cdot \overline{F} \, ds \text{ where } \overline{F} = 4x \, \hat{i} + 3y \, \hat{j} 2z \, \hat{k} \text{ and s is the surface bounded by }$ x = 0, y = 0, z = 0 and 2x + 2y + z = 4
 - (c) Based on the following data, can you say that there is no relation between smoking and literacy.

-	smokers	nonsmokers			
Literates	83	57			
Illiterates	45	68			

- 5. (a) A random variable X follows a Poisson distribution with variance 3 calculate p(X=2) and $p(X\ge4)$
 - (b) Use Stoke's theorem to evaluate $\int_{c}^{\infty} \overline{F} . d\overline{r}$ where $\overline{F} = x^{2}i + xyj$ and c is the boundary of the rectangle x=0, y=0, x=a, y=b
 - (c) Find the equations of the two lines of regression and hences find correlation coefficient from the following data.

X	65	66	67	67	68	69	70	72
у	67	68	65	68	72	72	69	71

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Two independent samples of sizes 8 and 7 gave the following results. 6.

17 15 21 16 18 16 14 14 15 19 15 18 16 Sample 1: Sample 2: 15

Is the difference between sample means significant.

(b) If $A = \begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$ find A^{50} 6.

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Use the Kuhn-Tucker Conditions to solve the following N.L.P.P Maximise $z=2x_1^2-7x_2^2+12x_1x_2$

8

Subject to $2x_1 + 5x_2 \le 98$

 $x_1, x_2 \ge 0$

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