(3 Hours)

[Total Marks: 80]

N.B.: 1) Question No. **1** is **Compulsory**.
2) Answer **any THREE** questions from Q.2 to Q.6.
3) Figures to the right indicate full marks.

Q.1 (a) Evaluate $\int_0^{1+i}(y + ix^2)\,dz$ along the parabola $y = x^2$. (5)

(b) If $\overline{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is irrotational then find the values of a, b, c (5)

(c) A continuous random variable has pdf $f(x) = ke^{-x}, 0 \leq x < \infty$. Determine k, mean, variance. (5)

(d)

x	3	5	4	6	2
y	3	4	5	2	6

Calculate the Karl Pearson's coefficient of correlation . (5)

Q.2 (a) The following are the marks scored by students in two tests in a subject. Calculate Spearman's rank correlation coefficient of from the following data. (6)

Marks in Test 1	18	20	34	52	12
Marks in Test 2	39	23	35	18	46

(b) Find the MGF of a random variable X whose p.m.f is given by (6)

x	0	1	2	3
P(x)	1/18	1/9	5/18	10/18

. Hence find mean and Variance of X.

(c) Obtain all possible Laurent's series expansion of (8)
$f(z) = \dfrac{z}{(z-1)(z-2)}$ about $z = 0$.

Q.3 (a) Three urns are there containing white and black balls; first urn has 3 white and 2 black balls, second urn has 2 white and 3 black balls and third urn has 4 white and 1 black balls. Without any biasing one urn is chosen from that one ball is chosen randomly which was white. What is probability that it came from the third urn? (6)

(b) Fit the second degree polynomial for following data (6)

X	1	2	3	4	5	6	7
Y	-5	-2	5	16	31	50	73

(c) Prove that $\overline{F} = (2xy + z)i + (x^2 + 2yz^3)j + (3y^2z^2 + x)k$ is conservative. Find scalar potential of $\overline{F}$. Hence find the work done of moving particle from (1,2,0) to (2,2,1). (8)

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Page 1 of 2

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Q.4 (a) Using Green's Theorem evaluate $\int_c (x^2 - y)dx + (y^2 + x)dy$ and c (6)
is closed curve of the region bounded by $y = 4$ and $y = x^2$.

(b) Samples of two types of electric bulbs were tested for length of life (6)
and following data were obtained

	Type I	Type II
Number of samples	8	7
Mean of samples(in hour)	1134	1024
Standard Deviation(in hour)	35	40

Test at 5% level of significance whether the difference in the sample
means is significant.

(c) In a normal Distribution, 30% of students scored below 35 and 10% (8)
scored above 60. Find the mean and standard deviation.

Q.5 (a) The standard deviation from two random samples of sizes 9 and 13 (6)
are 1.99 and 1.9. Can the samples be regard as drawn from normal
population with same standard deviation? $(F_{(8,12)}(0.025) =$
$3.51, F_{(12,8)}(0.025) = 4.20)$

(b) Use Gauss's Divergence Theorem to evaluate $\iint_S \overline{N}.\overline{F} \, ds$, where (6)
$\overline{F} = 4xi - 2y^2j + z^2k$ and S is region bounded by $x^2 + y^2 = 4, z = 0, z = 4$.

(c) Obtain both Line of regressions for the data given below (8)

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

Also find X for Y = 70.

Q.6 (a) Evaluate $\int_c \frac{z+3}{(2z^2+3z-2)}dz$, where c is the circle $|z-i|=2$. (6)

(b) The following data relate to marks obtained by 11 students in 2 tests, (6)
one held at the beginning of the year and the other at the end of the
year after intensive coaching:

Test 1	19	23	16	24	17	18	20	18	21	19	20
Test 2	17	24	20	24	20	22	20	20	18	22	19

(c) The following table gives the number of accidents in a district during (8)
a week. Apply χ^2 test to find whether the accidents are uniformly
distributed over the week.

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

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