(OLD COURSE)   QP Code : **3960**

(3 Hours)   [Total Marks : 100

N.B. (1) Question No. 1 is **compulsory**.
    (2) Attempt any **four** from the **remaining**.
    (3) Use of statistical table is **allowed**.

1. (a) Using Green's theorem evaluate $\int_c (xy + y^2)dx + x^2\, dy$ where c is the closed   5

   curve of the region bounded by $y = x$ and $y = x^2$.

   (b) A continuous random variable has probability density function $f(x) = 6(x - x^2)$, $0 \le x \le 1$.   5
   Find mean and variance.

   (c) A random sample of 900 items is found to have a mean of 65·3 cms. Can it be   5
   regarded as a sample from a large population whose mean is 66·2 cms and
   standard deviation is 5cms at 5% level of significance.

   (d) Evaluate $\int_c \dfrac{3z^2 + z}{z^2 - 1}\, dz$ where c is the circle $|z| = 2$.   5

2. (a) Use Gauss's divergence theorem to evaluate $\iint_s \overline{N}.\overline{F}\ ds$ where $\overline{F} = 4xi + 3yj - 2zk$ 6

   and s is the surface bounded by $x = 0$, $y = 0$, $z = 0$ and $2x + 2y + z = 4$.

   (b) In an intelligence test administered to 1000 students the average score was 42   6
   and standard deviation 24. Find the number of students
       (i) exceeding the score 50
       (ii) between 30 and 54.

   (c) Evaluate $\int_0^{2\pi} \dfrac{\cos 2\theta}{5 + 4\cos\theta}\, d\theta$ using Residue theorem.   8

3. (a) Two independant samples of sizes 8 and 7 gave the following results   6

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

   Is the difference between sample means significant.

   (b) Determine the poles of the following and find the residue at each pole $\dfrac{z+2}{z^2(z-1)}$.   6

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(c) Find the equations of the two lines of regression and hence find correlation   8
coefficient from the following data

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

4. (a) If 10% bolts produced by a machine are defective. Find the probability that out   6
of 5 bolts selected at random atmost one will be defective.

(b) Find Laurent's series which represents the function   6

$$f(z) = \frac{2}{(z-1)(z-2)} \text{ when } 1 < |z| < 2.$$

(c) Prove that $\overline{F} = \left(y^2 \cos x + z^3\right)i + (2y \sin x - 4)j + \left(3xz^2 + 2\right)k$ is a conservative   8
field. Find the scalar potential for $\overline{F}$ and the workdone in moving an object in
this field from $(0, 1, -1)$ to $\left(\dfrac{\pi}{2}, -1, 2\right)$.

5. (a) If x is poison variate and $P(x = 0) = 6\,P(x = 3)$ find $P(x=2)$.   6

(b) Tests made on breaking strength of 10 pieces of a metal wire gave the following   6
results 578, 572, 570, 568, 572, 570, 570, 572, 596, 584 in kgs.
Test if the breaking strength of the metal wire can be assumed to be 577 kg.

(c) The following table shows the marks obtained by 10 students in Accountancy   8
and statistics. Find the coefficient of rank correlation

Student No. :	1	2	3	4	5	6	7	8	9	10
Accountancy :	45	70	65	30	90	40	50	57	85	60
Statistics :	35	90	70	40	95	40	60	80	80	50

6. (a) Use stoke's theorem to evaluate $\int_c \overline{F}.d\overline{r}$ where $\overline{F} = x^2\,i + xy\,j$ and c is the   6
boundary of the rectangle $x = 0$, $y = 0$, $x = a$, $y = b$.

(b) A random variable X has the following probability distribution   6

$$X \qquad : \quad -2 \quad 3 \quad 1$$
$$P(x = x) : \quad \frac{1}{3} \quad \frac{1}{2} \quad \frac{1}{6}$$

Find the first four raw moments and central moments.

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(c) Using the coefficient of variation find which of the following batsman is more consistent in scoring. Would you also accept him as a better rungetter a give reason.

| Score of A | : | 42 | 115 | 6 | 73 | 7 | 19 | 119 | 36 | 84 | 29 |
| Score of B | : | 47 | 12 | 76 | 42 | 4 | 51 | 37 | 48 | 13 | 0 |

7. (a) Find a,b,c if $\overline{F} = (axy + bz^3)i + (3x^2 - cz)j + (3xz^2 - y)k$ is irrotational.

(b) The following table gives the number of accidents in a city during a week. Find whether the accidents are uniformly distributed over a week.

| Day | : | Sun | Mon | Tue | Wed | Thus | Fri | Sat |
| No. of accidents | : | 13 | 15 | 9 | 11 | 12 | 10 | 14 |

(c) Find the mean and variance of Binomial distribution.