



**VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE**  
[Central Technological Institute, Maharashtra State]  
Matunga, Mumbai-400 019

SEMESTER EXAMINATION: End Semester Examination  
SEMESTER & PROGRAM : S.Y.BTech (Civil / Mech / Prod / Text) IV  
TIME ALLOWED : 3 hrs  
COURSE (CourseCode) : Applied Mathematics-IV(MA-0204)

DATE OF EXAM : 25/04/14  
TIME : 1.30-4.30pm  
MARKS : 100

- Instructions**
3. All questions carry equal marks.
  4. Figures to the right indicate full marks.
  3. Answers individual question must be grouped and written together.

**Que.1.(a)** Each coefficient of the equation  $ax^2 + bx + c = 0$  is determined by throwing an ordinary die. Find the probability that the equation will have a real roots. (05)

(b) Three urn contain 6 red , 4 black; 4red, 6 black; 5red , 5 black balls respectively. One of the urn is selected at random and then a ball is drawn from it. If the ball drawn is red , find the probability that it is drawn from the first urn. (05)

(c) A box contains  $2^n$  tickets of which  $nCr$  tickets bear the number  $r$ . ( $r=0,1,2,\dots,n$ ) A group of  $m$  tickets is drawn , what is the expectation of the sum of their number. (05)

(d) Find the directional derivative of  $\phi = \frac{y}{(x^2+y^2)}$  at  $(0,1)$  in the direction making an angle  $30^\circ$  with positive  $x$  axis.

**Que.2.(a)** Find coefficient of correlation and rank correlation from the following data (08)

X	52	53	42	60	45	41	37	38	25	27
Y	65	68	43	38	77	48	35	30	25	50

(06)

(b) If  $X$  denote the outcome when fair die is tossed, find the moment generating function of  $X$  about origin and hence find mean , variance , Coefficient of Skewness.

(06)

(c) Show that  $\vec{F} = (ye^{xy} \cos z)i + (xe^{xy} \cos z)j - (e^{xy} \sin z)k$  is irrotational. And hence find the work done by  $\vec{F}$  in displacing a particle from  $A(0,0,0)$  to  $B(-1,2,\pi)$  along the straight line  $AB$  .

(08)

**Que3.(a)** Verify Greens theorem for  $\int (2x - y^3)dx - xydy$  over  $C$ . where  $C$  is the boundary of the annular region enclosed by the circle  $x^2 + y^2 = 1$  and  $x^2 + y^2 = 9$ .

(b) Show that in a Poisson distribution with unit mean the mean deviation about mean is  $(2/e)$  times standard deviation. (06)

(c) In a partially destroyed laboratory record of an analysis of correlation data the following result only are legible (06)  
Variance of  $x = 9$  , Regression equation  $8x - 10y + 66 = 0$  ,  $40x - 10y = 214$   
find the mean values and angle between two regression line.

- Que.4. (a) The specification of certain quality characteristic are  $15 \pm 6$  (in coded values). (08)  
15 Samples of 4 reading each gave the following values for mean and range.

Sample no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
mean	16.1	15.2	14.2	13.9	15.4	15.7	15.2	15	16.5	14.9	15.3	17.8	15.9	14.6	15.2
Range	3	2.1	5.6	2.4	4.1	2.7	2.3	3.8	5	2.9	13.8	14.2	4.8	5	2.2

Compute the control limits for mean and range charts. Hence deduce if the process is in control. If not, remove the doubtful samples and recomputed the values of mean and range. After testing the state of control, estimate the tolerance limit and find if the process will meet the required specifications.

$$(A_2 = 0.729, D_3 = 0, D_4 = 2.282, d_2 = 2.059)$$

(06)

- (b) Define normal distribution and hence find mean and variance of normal distribution.

- (c) Evaluate  $\int \vec{F} \cdot d\vec{r}$  where  $\vec{F}(x, y, z) = yi + zj + xk$  and C is the curve of intersection of the plane  $x + z = a$  and  $x^2 + y^2 + z^2 = a^2$ .

(06)

OR

- (c) Fit a curve of the form  $y = ab^x$  to the following data.

(06)

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

- Que.5.(a) Verify Gauss divergence theorem for  $\vec{F} = 4xi - 2y^2j + z^2k$  taken over the region bounded by the cylinder  $x^2 + y^2 = 4$ ,  $z = 0$  and  $z = 3$ . (08)

- (b) An advertising firm is trying to study market research for a new product. They have randomly selected 75 people in each of 5 different age groups and introduced the product to them the result of the survey is given below. Analyze the given data. (06)

Estimate activity	15-24	25-34	35-44	45-54	55-64
Purchase frequently	12	18	17	22	32
Rarely purchase	18	25	29	24	30
Never purchase	45	32	29	29	13

[Given: at 5% level of significance and 8 d.f. chi square is 20.09]

(06)

- (c) In a random sample of 600 men taken from big city 400 are found to be smokers. in another sample of 900 men taken from another city 450 are smokers. Do the data indicate that there is significant difference in the habit of smoking in the two cities? ( at 1% level of significance  $z = 2.33$  )

OR

(06)

- (c) Find the constants  $a, b, c$  if the directional derivative of  $\phi = ay^2x + byz + cz^2x^3$  has maximum magnitude 64 in the direction parallel to the z axis.