APPLIED MATHS IV
MAY-2018
S.E.SEM-IV

Total marks: 80

Total time: 3 Hours

INSTRUCTIONS:
(1) Question 1 is compulsory.
(2) Attempt any three from the remaining questions.
(3) Draw neat diagrams wherever necessary.
(4)Use of statistical table allowed

1. (a)Evaluate $\int_c |z| \, dz$,where C is the left hand of unit circle $|z|= 1$ from z=-I to z=I   **(20)**

    (b)If A=$\begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix}$, then find the eigen values of 4A^{-1}+3A+2I.

    (c)If the tangent of the angle made by the line of regression of y on x axis is 0.6 and $\sigma_y = 2\sigma_x$, find the correlation coefficient between x and y.

    (d)Construct the dual of the following L.P.P

    Minimize z=$x_2 + 3x_3$

    Subject to $2x_1 + x_2 \leq 3$

    $x_1 + 2x_2 + 6x_3 \leq 5$

    $-x_1 + x_2 + 2x_3 = 2$

    $x_1, x_2, x_3 \geq 0$

2. (a)Evaluate $\int_c \frac{e^{2z}}{(z+1)^4}$,where c is the circle $|z - 1| = 3$ **(06)**

    (b)Show that the matrix A=$\begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$ is derogatory.   **(06)**

    (C)For a normal variate with mean 2.5 and standard deviation 3.5 ,find the probability that   **(08)**
    [i]$2 \leq X \leq 4.5$ [ii]$-1.5 \leq X \leq 5.3$

3. (a)The daily consumption of electric power is a random variable X with probability distribution   **(06)**

    function f(x)=$\begin{cases} kxe^{-\frac{x}{3}}, x > 0 \\ 0, x \leq o \end{cases}$

Find the value of K,the expectation of K and the probability that on a given day the electric consumption is more than expected value.

(b)Solve the following L.P.P by simplex method **(06)**

Maximize z=4x$_1$+10x$_2$

Subject to $2x_1 + x_2 \leq 10$

$2x_1 + 5x_2 \leq 20$

$2x_1 + 3x_2 \leq 18$

$x_1, x_2 \geq 0$

(c)Expand f(z)=$\frac{2}{(z-1)(z-2)}$ in the regions **(08)**

$[i]|z|, 1 \quad [ii]1 < |z| < 2 \quad [iii]|z| > 2$.

4. (a)The incidence of an occupational disease in an industry is such that the workers have 20% chance of suffering from it.What is the probability that out of 6 workers chosen at random 4 or more will be suffering from disease? **(06)**

(b)Calculate the coefficient if correlation between X and Y from the following data. **(06)**

X	3	5	4	6	2
Y	3	4	5	2	6

(c)Show that the matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalizable. Find the transforming matrix M **(08)**

and the diagonal form D.

5. (a)Can it be concluded that the average life span of an Indian is 70 years, if a random sample of 100 indians has an average life span of 71.8 years with standard deviation 8.9 years? **(06)**

(b)Evaluate $\int_0^{2\pi} \frac{d\theta}{3+2cos\theta}$,using Cauchy's residue theorem. **(06)**

(c)Using the Kuhn-Tucker conditions,solve the following N.L.P.P **(08)**

Maximize z=$x_1^2 + x_2^2$

Subject to $x_1 + x_2 - 4 \leq 0$

$2x_1 + x_2 - 5 \leq 0$

$x_1, x_2 \geq 0$

6. (a)A die was thrown 132 times and the following frequencies were observed. **(06)**

No. obtained	1	2	3	4	5	6	Total
Frequency	15	20	25	15	29	28	132

Test the hypnothesis that the die is unbiased

(b)Two independent samples of sizes 8 and 7 gave the following results   **(06)**

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?

(c)Use big-M (penalty) method to solve the L.P.P   **(08)**
Maximise $z=3x_1-x_2$
Subject to $2x_1+x_2\leq 2$
   $x_1+3x_2\geq 3$
   $x_2\leq 4$; $x_1,x_2\geq 0$