(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETMA-202 **Subject: Applied Mathematics-IV**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit. Students can ask for statistical table.

Q1 (a) Find a particular integral of $(D_x^3 + 3D_x^2D_y - 2D_x^2)z = (x^2 + 2y)\,e^{2x+y}$. (7)

(b) A die is tossed thrice. Getting 2 or 4 on the die in a toss is success. Find the mean and variance of number of success. (6)

(c) Can y = 5 + 2.8 x and x = 3 – 0.5 y be the estimated regression equations of y on x and x on y respectively? Explain. (5)

(d) Write the dual to the following primal problem. (7)

Max $Z = 3x_1 + 10\,x_2 + 2x_3$

Subject to:

$2x_1 + 3x_2 + 2x_3 \le 7$

$3x_1 - 2x_2 + 4x_3 = 3$

Where $x_1, x_2, x_3 \ge 0$.

Prove that dual of the dual is primal.

Unit-I

Q2 (a) Find the general solution of $(D^3 - 4D^2D' + 4DD'^2)z = \cos(2x + 3y)$. (6)

(b) Find the complete solution of the equation: (6.5)

$$(D^2 + D'^2 + 2DD' + 2D + 2D' + 1)\,z = e^{2x+y}$$

Q3 (a) Solve $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0$ where $u(0, y) = 0$ and $\frac{\partial u}{\partial x}(0, y) = e^{-3y}$ for all y using the method of separation of variables. (6)

(b) A long rectangular plate of width π cm with insulated surfaces has its temperature equal to zero on both the long sides and one of the short side so that u(0, y) = 0, u (π, y) = 0, u(x, ∞) = 0 and u(x, 0) = kx. Find the steady state temperature within the plate. (6.5)

Unit-II

Q4 (a) In a bolt factory there are four machines A, B, C and D manufacturing 20%, 15%, 25% and 40% of the total output respectively. Of their outputs 5%, 4%, 3% and 2% in the same order are defective bolts. A bolt is chosen randomly from the factory's production and is found defective. What is the probability that the bolt was manufactured by machine A or D. (6)

(b) Calculate the first four moments for the following frequency distribution about the mean and explain the skewness and kurtosis of the frequency distribution. (6.5)

X:	-4	-3	-2	-1	0	1	2	3	4
Y:	3	4	5	7	12	7	5	4	3

Q5 (a) Find mean, variance and moment generating function of f(x), where

$$f(x) = \begin{cases} ae^{-ax}, & x > 0 \\ 0, & x \le 0 \end{cases}$$ (6)

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(b) If the probability that an individual suffers to a bad reaction form an injection of a given serum is 0.001, determine the probability that out of 2000 individuals. **(6.5)**
(i) exactly 3 (ii) more than 2
individual will suffer to a bad reaction.

Unit-III

Q6 (a) The two regression equation of the variable x and y are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. Given that variance of x = 9. Find **(6)**
(i) the mean of x and y
(ii) the standard deviation of y and
(iii) the coefficient of correlation between x and y.

(b) The results of measurement of electric resistance R of a copper bar at various temperature t^{0c} are listed below: **(6.5)**

t:	19	25	30	36	40	45	50
R:	76	77	79	80	82	83	85

If R = a + bt, find a and b.

Q7 (a) Write at least three important properties of Regression coefficient and prove that if two variables are uncorrelated then the regression lines are perpendicular to each other. **(6)**

(b) A sample of 10 boxes of chips is drawn in which the mean weight is 490 gm and standard deviation of weight is 9 gm. Can the sample be considered to be taken from a population having mean weight 500 gm where $t_{0.5} = 2.26$? **(6.5)**

Unit-IV

Q8 (a) Write the dual of the following problem: **(6)**

Min. $Z = 2x_1 + 3x_2 + 4x_3$
St. $2x_1 + 3x_2 + 5x_3 = 2$
$3x_1 + x_2 + 7x_3 \leq 3$
$x_1 + 4x_2 + 6x_3 = 5$
where $x_2, x_3 \geq 0$ and x_1 unrestricted.

(b) Using dual simplex method solve following LPP. **(6.5)**

Max. $Z = -3x_1 - 2x_2$
Subject to
$x_1 + x_2 \geq 1$
$x_1 + x_2 \leq 7$
$x_1 + 2x_2 \geq 10$
$x_2 \leq 3$
where $x_1, x_2 \geq 0$.

Q9 Using VAM method find basic feasible solution of the following transportation problem. Check optimality and hence find the optimal solution. **(12.5)**

From	A	B	C	D	Supply
I	21	16	25	13	11
II	17	18	14	23	13
III	32	27	18	41	19
Demand	6	10	12	15	43

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