3E1136

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B. Tech. III - Sem. (Main) Exam., Dec. - 2018

BSC Computer Science & Engineering

3CS2 – 01 Advanced Engineering Mathematics

CS, IT

Time: 3 Hours **Maximum Marks: 120**

Instructions to Candidates:

Attempt all ten questions from Part A, selecting five questions from Part B and four questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 The probability density function of the random variable x is given by $f(x) = \begin{cases} \frac{K}{\sqrt{x}}, & for\ 0 < x < y \\ 0, & elsewhere \end{cases}$ find the value of K. [2]

Q.2 Out of 800 families with four children each, how many families would be expected to have at least one boy? Assume equal probability for boys and girls. [2]

Q.3 Find the correlation coefficient between x and y when it is given that. [2]

$n = 15, \Sigma x = 50, \Sigma y = -30, \Sigma x^2 = 290, \Sigma y^2 = 300, \Sigma xy = -115$

Q.4 Define Binomial distribution. [2]

Q.5 Write short note on History of optimization. [2]

Q.6 Determine the maximum and minimum values of the function [2]

$f(x) = x^5 - 5x^4 + 5x^3 - 1$

Q.7 Determine the nature of the given matrix. [2]

$$A = \begin{bmatrix} -1 & -1 & -1 \\ -1 & -2 & -2 \\ -1 & -2 & -3 \end{bmatrix}$$

Q.8 An animal food company must produce 200 Kg of a mixture containing ingredients A_1 and A_2 daily. Ingredient A_1 costs ₹ 3.00 per kg and A_2 costs ₹ 8.00 per kg. Not more than 80 kg of A_1 can be used and at least 60 kg of A_2 must be used. Formulate the problem. [2]

Q.9 Write the dual of the given linear programming problem. [2]

Max $z = x_1 + 2x_2 - x_3$

S. to $2x_1 - 3x_2 + 4x_3 \leq 5$

$2x_1 - 2x_2 \leq 6$

$3x_1 - 3x_3 \geq 4$

$x_1, x_2, x_3 \geq 0$

Q.10 Define the slack, surplus and artificial variables in linear programming problem. [2]

PART – B

(Analytical/Problem solving questions) **[5×8=40]**

Attempt any five questions

Q.1 The first four moment of a distribution about the value 5 of the variable are 2, 20, 40, and 50. Find the mean, variance, β_1 and β_2. Comment upon the nature of distribution. [8]

Q.2 The joint probability mass junction of (x, y) is given by $p(x, y) = k(2x + 3y)$, $x = 0, 1, 2$; $y = 1, 2, 3$. Find – [8]

(a) K

(b) Marginal probability distribution of X.

(c) Marginal probability distribution of Y

(d) Conditional probability distribution of X given y =1.

Q.3 Of a large group of men 5% are under 60 inches in height and 40% are between 60 and 65 inches. Assuming a normal distribution find the mean height and standard deviation. [8]

Q.4 Define rectangular distribution and find its mean and variance. [8]

Q.5 Use Kuhn – Tucker conditions to [8]

Min $f(x, y, z) = x^2 + y^2 + z^2 + 20x + 10y$

s.to (a) $x \geq 40$

(b) $x + y \geq 80$

(c) $x + y + z \geq 120$

Q.6 Solve by simplex method. [8]

Min $Z = x_1 - 3x_2 + 2x_3$

s.to $3x_1 - x_2 + 3x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0$

Q.7 Find the initial basic feasible solution of the given transportation problem. [8]

Warehouse → factory ↓	W_1	W_2	W_3	W_4	Factory Capacity
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Warehourse requirement	5	8	7	14	34

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×15=60]**

Attempt any four questions

Q.1 From a lot of 25 items containing 5 defectives, a sample of 4 items is drawn at random,

(i) without replacement (ii) with replacement.

Find the expected value of the number of defectives in the sample in each case. [15]

Q.2 Define Poisson distribution and find its mean and variance. [15]

Q.3 Write 12 applications of Optimization techniques in Engineering. [15]

Q.4 Find the extreme points of $u = 2x + y + 10$ subject to $g(x, y) = x + 2y^2 - 3 = 0$ [15]

Q.5 A certain equipment's needs five repair jobs, which have to be assigned to five mechanics. The estimated time (in hours) that each mechanic requires to do the repairs is given by the following table. [15]

Assuming that each mechanic can be assigned to only one Job, determine the minimum time assignment.

Jobs →	J_1	J_2	J_3	J_4	J_5
M_1	7	5	9	8	11
M_2	9	12	7	11	10
M_3	8	5	4	6	9
M_4	7	3	6	9	5
M_5	4	6	7	5	11