MANIPAL INSTITUTE OF TECHNOLOGY
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DEPARTMENT OF MATHEMATICS

IV SEMESTER B.TECH. (AIML- COMPUTER SCIENCE ENGINEERING)

END SEMESTER MAKEUP EXAMINATION

Subject : Probability & Optimization MAT 2233

Date of Examination: 19-06-2024 Time: 2.30pm – 5.30pm MAX.MARKS: 50

Q. No	Question	M	CO	PO	Blooms Taxonomy level
1A	A shop sells six different flavors of ice cream. In how many ways, a customer can choose 4 ice-cream cones, if a) They are all of different flavors. b) They are not necessarily of different flavors c) They contain only two or three flavors. d) They contain 3 different flavors.	4	1	1,2,12	4
1B	How many of the first 1000 integers are not divisible by 2, 3, 5, 7?	3	1	1,2,12	4
1C	In how many ways can four letters of the word 'ENGINE' can be arranged using generating function?	3	1	1,2,12	4
2A	Three balls are drawn at random without replacement from a box containing 2 white, 3 red and 4 black balls. Let X denote the number of white balls drawn and Y denote the number of red balls drawn. a) Find the joint distribution of X and Y. b) Find the marginal distribution of X and Y.	4	2	1,2,12	3
2B	A box contains tags marked 1, 2, ..., n. Two tags are chosen at random without replacement. Two tags are chosen at random with replacement. Find the probability that the numbers on the tags will be consecutive integers.	3	2	1,2,12	3
2C	The chance that a doctor 'A' will diagnose a disease correctly is 60%. The chance that a patient of 'A' will die after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. If a patient of 'A' dies, what is the chance that his disease was correctly diagnosed?	3	2	1,2,12	3
3A	A large number of parts manufactured by a machine, the mean number of defectives in a box of 20 is 2. Out of 1000 such boxes, how many would be expected to contain at least three defective parts?	4	3	1,2,12	3

3B	Suppose that the continuous random variable is uniformly distributed over (0,1), find the probability density function of $Y = X^2+1$.	**3**	**3**	**1,2,12**	3
3C	Let $f(x) = \begin{cases} kx^3; & 0 < x < 1 \\ 0; & otherwise \end{cases}$ a) Find k such that $f(x)$ is a pdf. b) Find variance of X.	**3**	**3**	**1,2,12**	3
4A	In an examination taken by 500 candidates the marks obtained are normally distributed. What should be the mean and standard deviation if 50 students get distinction and 50 students failed in the examination if the cutoff for distinction and pass being 80% and 35% respectively?	**4**	**3**	**1,2,12**	3
4B	Find the unit normal to the surface $(x-1)^2 + y^2 + (z+2)^2$ at the point (3,1, -4).	**3**	**4**	**1,2,12**	3
4C	Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x + y + z^2 = 5$ at the point (2, -1, 2).	**3**	**4**	**1,2,12**	3
5A	Maximize $Z = x_1 + 3x_2$ Subject to $x_1 + 2x_2 \leq 10,\ 0 \leq x_1 \leq 5,\ 0 \leq x_2 \leq 4$ using simplex method.	**4**	**5**	**1,2,12**	3
5B	Maximize $Z = 3x_1 + 5x_2$ Subject to $x_1 + 2x_2 \leq 200,\ x_1 + x_2 \leq 150,\ x_1 \leq 60$, $x_1 \geq 0,\ x_2 \geq 0$ using graphical method.	**3**	**5**	**1,2,12**	3
5C	A patient has been recommended two nutrients N_1 and N_2 everyday. Minimum intake is 10g for N_1 and 15g for N_2 everyday. These nutrients are available in two products P_1 and P_2. One unit P_1 contains 2g of N_1 and 3g of N_2. One unit of P_2 contains 1g of N_1 and 2g of N_2. Cost per unit is Rs. 200 for P_1 and Rs. 150 for P_2. Formulate as LPP such that nutrient requirement can be fulfilled at the lowest cost.	**3**	**5**	**1,2,12**	3

Set by _

Name	Signature
Dr.Prathima J	
Dr.Divya Shenoy	

Scrutinized by _____
(Signature)