Sanjay Ghodawat University, Kolhapur 2018-19
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Act No XL, 2017

Year and Program: **2018-19, M.Sc.-II** | **School of Science** | **Department of Mathematics**

Course Code – MTS 602 | **Course Title – Discrete Mathematics** | **Semester – IV**

Day and Date – Tuesday, 21st May 2019 | **End Semester Examination** | **Time:** 2:30 pm to 3:00 pm **Max Marks: 100**

PRN number – | **Seat no-** | **Answer Booklet No.-**

Students' Signature - | **Invigilator's Signature –**

Instructions:

1) All questions are compulsory.
2) **Attempt Q.1 within first 30 minutes.**
3) Each MCQ type question is followed by four plausible alternatives, Tick (√) the correct one.
4) Answer to question 1 should be written in the question paper and submit to the Jr. Supervisor.
5) If you tick more than one option it will not be evaluated
6) Figures to the right indicate full marks
7) Use **Blue ball pen** only.

Q.1	Tick Mark correct alternative	Marks	Bloom's Level	Cos
1)	Let a set of all divisors of 70 i.e. D_{70}= {1, 2, 5, 7, 10, 14, 35, 70} then how many complements does 5 have? A) 7 B) 2 C) 1 D) Complement does not exist.	02	L_2	CO1
2)	In a tree T, with n vertices, minimum eccentricity 4 then radius of that tree is _____ A) 2 B) 8 C) D) Inadequate information.	02	L_2	CO2
3)	If a graph G with n vertices has e number of edges then rank of its circuit matrix is _____ A) e-n-1 B) n-e-1 C) e+n-1 D) e+n+1	02	L_3	CO3
4)	A device that can be used to improve the efficiency of communication model is _____ A) Encoder B) Decoder C) Receiver D) Noise	02	L_1	CO4
5)	The Hamming distance between x and y is denoted by____	02	L_2	CO4

A) $x \oplus y = x\bar{\vee}y$ B)$H(x,y) = x_i\bar{\vee}y_i$

C) $H(x,y) = (\sum_{i=1}^{n} x_i\bar{\vee}y_i)$ D) $H(x,y) \geq 0$

6) What is the minimum distance of a given code $H(x,y) =$ ____ 02 L_3 CO4

$x =< 1,0,0,1 >$

$y =< 0,1,0,0 >$

A) 2 B)3 C)1 D)0

7) If m=3 and n=7 in a given message then K for detection and correction of error is ___ 02 L_1 CO4

A) 10 B) - 4 C) 2 D) 4

8) Let 'a' be a numeric function such that a_r is equal to the remainder when the integer r is divided by 19.Let 'b' be the numeric function such that 02 L_2 CO5

$b_r = 0$ if r is divisible by 31

$= 1$ otherwise

If $c_r = a_r + b_r$ then for which of the following value of r, c_r=0?

A) $r = 1$ B) all values of r C) $r = 0$ D) $r > 1$

9) Let 'a' be a numeric function such that a_r is equal to the remainder when the integer r is divided by 7.Let 'b' be the numeric function such that 02 L_2 CO5

$b_r = 0$ if r is divisible by 5

$= 1$ o.w.

If $d_r = a_r . b_r$ then for what values of r, d_r=1 ?

A) $r = 7k + 1$ and $r = 5k$ B) $r = 7k + 1$ and $r \neq 5k$

C) $r = 7k + 1$ or $r = 5k$ D) $r = 7k + 1$ or $r \neq 5k$

10) Generating function for the discrete numeric function 02 L_2 CO5

$a_r = 2^r , r \geq 0$ is_____

A) $\frac{1}{(1-z)^2}$ B) $\frac{1}{1-2z}$ C) $\frac{1}{1-z}$ D) $\frac{1}{1+2z}$

Year and Program: 2018-19, M.Sc.-II | **School of Science** | **Department of Mathematics**

Course Code: MTS602 | **Course Title: Discrete Mathematics** | **Semester – IV**

Day and Date: Tuesday, 22nd May 2019 | **End Semester Examination (ESE)** | **Time:** 3:00pm to 5:30pm | **Max Marks: 100**

Instructions:
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Non-programmable calculator is allowed

		Marks	Bloom's Level	CO
Q.2	**Attempt any TWO**			
A)	Design a three-input minimal AND-OR circuit L with the following truth table by using Karnaugh map method. T=[A, B, C; L]=[00001111, 00110011, 01010101]	06	L_4	CO1
B)	Let E be the Boolean expression given in the karnaugh map in following figure.	06	L_4	CO1

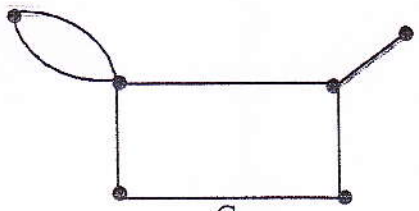
	zt	zt'	$z't'$	$z't$
xy			✓	✓
xy'	✓	✓		
$x'y'$	✓	✓		
$x'y$			✓	

a) Write E in its complete-sum of-products form.

b) Find minimal form for E.

C)	Write the following Boolean expression in an equivalent sum of minterms in three variables x_1, x_2 and x_3. a) $x_1 * x_2$ b) $x_1 \oplus x_2$ c) $(x_1 \oplus x_2)' * x_3$	06	L_4	CO1
Q.3	**Attempt any TWO**			
A)	Let G be a graph with n-vertices then show that the following three statements are equivalent. i) G is a tree. ii) G is an acyclic graph with $(n-1)$ edges. iii) G is an connected graph with $(n-1)$ edges.	07	L_4	CO2
B)	If in a graph G there is one and only one path between every pair of vertices, then show that G is a tree.	07	L_4	CO2

	C)	Prove that a graph G is disconnected if and only if vertex set V can be partitioned into two non-empty, disjoint subsets V_1 and V_2such that there exist no edge in G whose one end vertex is in subset V_1 and the other in subsetV_2.	07	L_5	CO2
Q.4		**Attempt any TWO**			
	A)	a) Let $A = \{x, y, z\}$. If R is the relation of proper inclusion on the all possible subsets of A, then find the matrix of the relation R. b) Find cutset matrix for the following graph G.	07	L_5	CO3



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	B)	Among the integers 1 to 1000, i) How many of them are not divisible by 3 nor by 5 nor by 7? ii) How many are not divisible by 5 or 7 but divisible by 3?	07	L_4	CO3
	C)	Among 75 children who went to an amusement park, where they could ride on merry-go-round, roller coaster and ferris wheel. It is known that, 20 of them had taken all the three rides and 55 had taken at least two of the 3 rides. Each ride costs Rs.0.50 and total receipt of park is Rs.70. Determine the number of children who did not try any of the rides.	07	L_4	CO3
Q.5	A)	For message construct the error codes $x_5 = x_1 + x_2 + x_3$ $x_6 = x_1 + x_2 + x_4$ $x_7 = x_2 + x_3 + x_4$	08	L_4	CO4
		OR			
	A)	Evaluate error correcting code by using $H=\begin{pmatrix}1 & 1 & 0 & 1 & 0 & 0\\ 1 & 0 & 1 & 0 & 1 & 0\\ 1 & 1 & 1 & 0 & 0 & 1\end{pmatrix}$ $x_4 = x_1 + x_2$ $x_5 = x_1 + x_3$ $x_6 = x_1 + x_2 + x_3$	08	L_4	CO4
	B)	Prove that Hamming distance satisfies the property by example $a) H(x,y) \geq 0$ $\quad$ $b)\ H(x,y) = H(y,x)$	07	L_4	CO4
	C)	Describe Communication Model and Basic Error Correction model in detail.	05	L_2	CO4

Q.6 **Attempt any FOUR.**

a)	Determine the generating function of the numeric functions $(0^2, 1^2, 2^2, \ldots, r^2, \ldots)$.	05	L_4	CO5
b)	Determine the discrete numeric function corresponding to following generating function $A(z) = \frac{1+z^2}{4-4z+z^2}$	05	L_4	CO5
c)	Determine the particular solution for the following differential equation $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2$	05	L_4	CO5
d)	Solve the following recurrence relation $a_r - 2a_{r-1} + 2a_{r-2} - a_{r-3} = 0$ where, $a_0 = 2, a_1 = 1, a_2 = 1$.	05	L_4	CO5
e)	Solve the following recurrence relation $a_r - 7a_{r-1} + 10a_{r-2} = 3^r$ where, $a_0 = 0, a_1 = 1$.	05	L_4	CO5

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