Sanjay Ghodawat University, Kolhapur

Established as State Private University under Govt. of Maharashtra.

Act No XL, 2017

2018-19

EXM/P/09/00

Year and Program: 2018-19, M.Sc.-II	**School of Science**	**Department of Mathematics**
Course Code – MTS606	**Course Title – Discrete Mathematics**	**Semester – IV**
Day and Date – Tusdy, 21st may 2019	**End Semester Examination**	**Time:** 2:30pm to 3:00pm
		Max Marks: 100
PRN number –	**Seat no-** (A)	**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: MTS606	**Course Title: Graph Theory**	**Semester – IV**
Day and Date: Saturday 25-05-2019	**End Semester Examination (ESE)**	**Time:** 2.5 Hrs. 3 to 5.30 pm. **Max Marks: 100**

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

B

Q.N			Marks	Bloom's Level	CO
Q.2		Solve any **Two** of the following.			
	a)	Show that in any graph G there is an even number of odd vertices.	06	L2	CO1
	b)	Use the powers of the adjacency matrix to test where the following graphs are connected or not? Also draw the graph corresponding to the given matrix. $A=\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 0 & 3 & 2 \\ 2 & 3 & 0 & 1 \\ 3 & 2 & 1 & 0 \end{bmatrix}$	06	L3	CO1
	c)	Prove that a graph is *2-regular* if and only if all its connected components are cycles.	06	L5	CO1
Q.3		Attempt any **TWO** of the following.			
	a)	If T is a tree with n vertices then shows that, it has precisely $(n-1)$ edges.	07	L2	CO2
	b)	Prove that G is connected graph if and only if it has a spanning tree.	07	L5	CO2
	c)	Show that a given connected graph G is an Euler graph if and only if all vertices of G are of even degree.	07	L4	CO2
Q.4	a)	Prove that the complete graph of five vertices is non-planar.	06	L5	CO3
	b)	Define Planar graph. Show that $K_{3,3}$ is not a planar graph.	08	L4	CO3

OR

ESE

			Marks	Level	CO
	b)	(i) Prove that in arborescence there is a directed path from root R to every other vertex. (ii) Prove that a circuitless diagraph G is an arborescence if there is a vertex v in G such that every other vertex is accessible from v, and v is not accessible from any other vertex.	08	L5	CO3
Q.5		Solve any **TWO** of the following.			
	a)	Prove the following statements. i) Every tree with two or more vertices is 2-chromatic. ii) A graph of n vertices is a complete graph if and only if its chromatic polynomial is $P_n(\lambda)=\lambda(\lambda-1)(\lambda-2)\ldots(\lambda-n+1)$	10	L5	CO4
	b)	Prove that if G is simple, then either $X'=\Delta$ or $X'=\Delta+1$	10	L5	CO4
	c)	Define Clique. State and prove Ramsey's theorem.	10	L5	CO4
Q.6	a)	Define. i) Vector space ii) Field iii) Cycle space iv) Orthogonal Complements	08	L1	CO5
	b)	Attempt any TWO of the following.			
		i) For a matrix $M=\begin{bmatrix}1 & 2\\ 3 & 4\\ 5 & 6\end{bmatrix}$, show that the function $f:R^2\rightarrow R^3$ with $f(x)=Mx$ is a linear transformation.	06	L4	CO5
		ii) Let $G=(V,E)$ be a graph with cycle space C and edge cut space C^* then prove that these subspaces are orthogonal complements if and only if $C\cap C^*=\phi$	06	L5	CO5
		iii) Let $G=(V,E)$ be a connected graph and $T=(V,E')$ be a spanning tree of G then show that every minimal edge cut of G contains at least one element of T.	06	L4	CO5

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ESE