

Applied Mathematics -IV

University of Mumbai

QP-2

Examinations Summer 2022

Program No : 1T01224

Name of the Examination : S.E.(Information Technology Engineering)(SEM-IV)(Choice Base Credit Grading System)(R2016)

Subject (Paper Code): 41001 // Applied Mathematic

Time: 2-hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks						
1.	Greatest common divisor of (225,120)						
Option A:	17						
Option B:	15						
Option C:	10						
Option D:	2						
2.	A discrete random variable X has the following probability distribution						
	X	-2	-1	0	1	2	3
	P(X=x)	0.1	k	0.2	2k	0.3	3k
	Find k						
Option A:	1/10						
Option B:	1/15						
Option C:	1/20						
Option D:	1/5						
3.	Find the correlation coefficient between X and Y if $n = 5$, $\sum x = 23, \sum y = 36, \sum (X - \bar{X})^2 = 3.2, \sum (Y - \bar{Y})^2 = 58.8, \sum (X - \bar{X})(Y - \bar{Y}) = 12.4$						
Option A:	Approximately 0.70						
Option B:	Approximately 0.80						
Option C:	Approximately 0.90						
Option D:	Approximately 0.95						
4.	If a random variable X follows Poisson distribution such that $P(X=1) = 2P(X=2)$ Find the mean.						
Option A:	1						
Option B:	2						
Option C:	3						
Option D:	4						
5.	Given $N = 10, \sum d_i^2 = 96$. Find the rank correlation coefficient R.						
Option A:	$R=0.4181$						
Option B:	$R=0.5181$						
Option C:	$R=0.2524$						
Option D:	$R=0.3524$						
6.	If a 4 regular graph has 12 edges, find the number of vertices of the graph						
Option A:	6						
Option B:	3						
Option C:	4						
Option D:	5						

7.	A connected planar graph has 9 vertices having degree 2,2,2,3,3,3,4,4,5. How many edges are there in graph
Option A:	26
Option B:	12
Option C:	14
Option D:	28
8.	What is the remainder if 7 divides 2^{50}
Option A:	1
Option B:	2
Option C:	3
Option D:	4
9.	Find the inverse of a modulo m when $a=3$ and $m=5$
Option A:	5
Option B:	3
Option C:	2
Option D:	7
10	Boolean expression $(a \wedge b) \vee (\bar{a} \wedge b \wedge \bar{c}) \vee (b \wedge c)$ can be simplified as
Option A:	$b \vee (a \wedge c)$
Option B:	$b \wedge (a \vee \bar{c})$
Option C:	$a \wedge (b \vee c)$
Option D:	$\bar{a} \vee (b \wedge c)$

subjective/descriptive questions

Q2 (20 Marks)	Solve any Four out of Six	5 marks each									
A	Based on the following data determine if there is a relational between literacy and smoking										
	<table> <tr> <th></th><th>Smokers</th><th>Non-smokers</th></tr> <tr> <td>Literates</td><td>83</td><td>57</td></tr> <tr> <td>Illiterates</td><td>45</td><td>68</td></tr> </table>		Smokers	Non-smokers	Literates	83	57	Illiterates	45	68	
	Smokers	Non-smokers									
Literates	83	57									
Illiterates	45	68									
B	Prove that $111^{333} + 333^{111}$ is divisible by 7.										
C	A hospital switch board receives an average of 4 emergency calls in 10 minutes interval. What is the probability that there are at least 2 emergency calls in an interval of 10 minutes.										
D	Find smallest positive integer modulo 5, to which $3^2, 3^3, 3^4, 3^{10}$ is congruent.										
E	Let $L = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and relation be "is divisible by." List the complement of all elements in L.										
F	Prove that the set of cube roots of unity is a group under multiplication of complex numbers.										
Q3 (20 Marks)	Solve any Four out of Six	5 marks each									

A	Calculate the value of rank correlation coefficient from the following data regarding the marks of 6 students in statistics and accountancy in a test						
	Marks in Statistics	40	42	45	35	36	39
	Marks in Accountancy	46	43	44	39	40	43
B	Define Bipartite graph and Planar graph.						
C	Draw Hasse diagram of the poset $A = \{2, 3, 6, 12, 24, 36, 72\}$ under the relation of divisibility. Is it a lattice?						
D	If the mean of following distribution is 16 find m, n and variance						
	X	8	12	16	20	24	
	P(X=x)	1/8	m	n	1/4	1/2	
E	Find the Jacobi's symbol of $\left(\frac{32}{15}\right)$.						
F	Find $5^{-1} \bmod (23)$.						

Q4 (20 Marks)	Solve any Four out of Six	5 marks each
A	Using Euclid's Algorithm, find x and y satisfying the following $\text{Gcd}(-306, 675) = 306x + 675y$	
B	Ten individuals are chosen at random from population and their heights are found to be 63, 63, 64, 65, 66, 69, 69, 70, 70, 71 inches. Test if the mean height is 65.	
C	A random variable X has the following probability	
	X	0 1 2
	P(X=x)	1/3 1/3 1/3
	Find moment generating function and first four raw moments.	
D	Give an example of tree (sketch the tree).	
E	Give an example of graph which is Hamilton but not Eulerian.	
F	Express the Boolean expression $E(x_1, x_2, x_3) = x_1 \vee x_2$ into disjunctive form.	