U8432

Reg. No.: .....

Name:.....

University of Kerala

First Semester Degree Examination, November 2024

Four Year Under Graduate Programme

Discipline Specific Core Course

Mathematics

UK1DSCMAT107 Relation, Functions and Number theory

Academic Level: 100-199

Time:2 Hours **Max.Marks:56**

Part A.

Answer All Questions Objective Type. 1 Mark Each.
(Cognitive Level: Remember/Understand)
6 Marks. Time: 5 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
1.	Give an example of a lattice.	Remember	CO 2
2.	When a relation can be a universal relation.	Remember	CO 1
3.	Give an example of a reflexive relation.	Understand	CO 1
4.	Find the coefficient of highest degree term in the expansion of $(2-3x)^5$.	Understand	CO 3
5.	Find $\sigma(20)$.	Understand	CO 4
6.	Find all equivalence classes in the relation defined on the integers as aRb if and only if $a=b$	Understand	CO 2

Part B.

Answer All Questions Two-Three sentences. 2 Marks Each.
(Cognitive Level: Remember/Understand/Apply)
10 Marks. Time: 20 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
7.	Check whether the function $f:R\to R$ defined by $f(x)=2x-3$ is a bijection.	Understand	CO 1
8.	If $a \vee bc$, with gcd(a, b) = 1, then prove that $a \vee c$.	Understand	CO 4

9.	Write the dual of $A=(B\cap A)\cup(A\cap B)$ where A and B are sets.	Apply	CO 1
10.	Let $f:R\to R\wedge g:R\to R$ *be defined as* $f(x)=x^2\wedge g(x)=2x+3$. *Determine fog*.	Apply	CO 2
11.	Find the least upper bound of poset $(\{1,2,4,8,16\},l)$ where l means "divisor of".	Apply	CO 3

Part C.

Answer all 4 questions, choosing among options within each question.
Short Answer. 4 Marks Each.
(Cognitive Level: Remember/Understand/Apply/Analyse)
16 Marks. Time:35 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
12.	A) If R is the relation on the set of positive integer such that $(a,b)\in R$ if and only if $a+b=3n$ for some integer n , prove that R is an equivalence relations OR B) For the sets A,B,Cprove or disprove the statement $A\cap C=B\cap C$and $A-C=B-C\to A=B$ with proper justification.	Apply	CO 1
13.	A) Check whether the relation R represented by $M_R=\begin{bmatrix}1&0&1\\0&1&0\\1&0&1\end{bmatrix}$ is an equivalence relation. OR B) Draw the digraph representing the partial ordering $\{(a,b):a\|b\}$ on the set $\{1,2,3,4,5,6,7,8\}$. Reduce it into the Hasse diagram representing the given partial ordering.	Apply	CO 2
14.	A) Prove that $1^2+2^2+3^2+\ldots+n^2=\frac{n(n=1)(2n+1)}{6}$ OR B) Let a and b be integers, not both zero. Prove that a and b are relatively prime if and only if there exist integers x and y such that $1=ax+by$. .	Apply	CO 3
15.	A) State and prove Wilson's Theorem. OR B) Prove that $1^p+2^p+3^p+\ldots+(p-1)^p$ is a multiple of p.	Analyse	CO 4

Part D.

Answer all 4 questions, **choosing among options within each question**.

Long Answer. 6 Marks Each.

(Cognitive Level: Understand/Apply/Analyse/Evaluate/Create)

24 Marks. Time: 60 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
16.	A) Define Partial ordered set with an example. Draw the Hasse diagram of the relation 'x divides y' on the set $A=\{1,2,3,4,6,8,9,12,18,24\}$ OR B) Let $(L,\leq)$ be a lattice. Prove that for any $a,b,c \in L$ (i) $a \wedge b = b \wedge a$ (ii) $a \vee (b \vee c) = (a \vee b) \vee c$	Analyse	CO 1
17.	A) State and prove fundamental theorem of arithmatic. OR B) Prove that for all $n \geq 1$, $2.6.10.14\ldots(4n-2)=\frac{(2n)!}{n!}$	Evaluate	CO 3
18.	A) Using Warshal's algorithm to find the transitive closure of a relation R={1,2), (2,3), (3,4), (2,1)} for the set A = {1, 2, 3, 4}. OR B) If R is the relation on A = $\{3,4,5,6\}$ Such that $(a,b) \epsilon R$ iff $a-b=even$. Find the rational matrix M_R . find also the rational matrices of R^{-1} , $\acute{R}$ and R^2.	Apply	CO 2
19.	A) Find the remainder when 2^{340} is divided by 341. OR B) Show that $18!+1 \equiv 0 \, mod(437)$.	Apply	CO 4