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 B. Sc. II | **School of Science** | **Department of Mathematics**

Course Code – MTS 208 | **Course Title – Number Theory** | **Semester – IV**

Day and Date – Tuesday 28/05/2019 | **End Semester Examination** | **Time:** 2·30 to 3·00 pm.
Max Marks: 100

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

Students' Signature - | (A) | **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 the correct answers.**	Marks	Bloom's Level	CO
i)	Which one of the following Diophantine Equations, cannot be solved?	02	L_2	CO1
	a) $6x+51y=22$ b) $2x+3y=32$			
	c) $33x+14y=115$ d) $4x+3y=15$			
ii)	If $d=(a,b)=ax+by$ then $(x,y)=$ _____	01	L_1	CO1
	a) 0 b) 1			
	c) -1 d) d			
iii)	The quotient and remainder when -1 is divided by 3 is____	01	L_2	CO1
	a) -1 and -1 b) -1 and 2			
	c) 1 and 2 d) 1 and -2			

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iv)	The greatest common divisor of $3^{13}.5^{17}$ and $2^{12}.3^{5}$ is____ a) 3^0 b) 3^1 c) 3^3 d) 3^5	02	L_2	CO1
v)	Which one of the following congruence relations is not possible? a) $6 \equiv 2(\text{mod } 4)$ b) $5 \equiv 2(mod\ 3)$ c) $10 \equiv 5(mod\ 5)$ d) $10 \equiv 2(mod\ 3)$	02	L_4	CO2
vi)	The number of factors of a prime number are: a) 2 b) 3 c) Depends on the prime number d) None of the mentioned	01	L_2	CO2
vii)	Prime Numbers are_____ a) Finite b) Infinite c) 100000 d) 255	01	L_1	CO2
viii)	If $ac \equiv bc\ (mod\ n)$ and d=____then $a \equiv b\ (mod \frac{n}{d})$ a) d= g.c.d.(c,n) b) d= g.c.d.(a,n) c) d= g.c.d.(b.n) d) d= g.c.d.(a,b)	02	L_2	CO2
ix)	$\mu(8) =$ _____ a) 1 b) 0 c) -1 d) 2	02	L_2	CO3
x)	$\phi(13) =$ _____ a) 13 b) 12 c) 14 d) 1	02	L_2	CO3
xi)	The number of positive divisors of 12 is ___ a) 5 b) 20 c) 6 d) 7	02	L_2	CO3
xii)	The sum of positive divisors of 20 is ___ a)40 b) 25 c) 20 d) 12	02	L_2	CO3

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Year and Program:2018-19 **School of Science** **Department: Mathematics**

B.Sc. II

Course Code: MTS208 **Course Title:** **Semester – IV**

Number Theory

Day and Date Tuesday 28/05/2019 **End Semester Examination** (B) **Time:** 3.00 to 5.30 pm. **Max Marks: 100**

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

		Marks	Bloom's Level	CO
Q.2	**Attempt any two of the following**			
a)	Prove by mathematical induction that $1+3+5+...+(2n-1)=n^2$	08	L_3	CO1
b)	Calculate g.c.d. of 1479 and 272 , also express it as their linear combination.	08	L_4	CO1
c)	Let S be a set of positive integers with properties a) $1 \in S$ b) $k \in S \Rightarrow k+1 \in S$ then prove that S is the set of all positive integers.	08	L_3	CO1
Q.3	**Attempt any two of the following**			
a)	Show that congruence relation is an equivalence relation.	08	L_3	CO2
b)	Solve $18x \equiv 30 (\text{mod } 42)$	08	L_4	CO2
c)	If $a \equiv b (\text{mod } n)$ then prove that $g.c.d.(a,n) = g.c.d.(b,n)$.	08	L_2	CO2
Q.4				
A	**Attempt any one of the following**			
a)	Define relatively prime integers. If g.c.d. $(a,b)=d$ then show that $\left(\frac{a}{d},\frac{b}{d}\right)=1$	08	L_2	CO1

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	b)	For any integer x show that $(a,b)=(a,b+ax)$	08	L_3	CO1
	B	**Attempt any one of the following**			
	a)	Solve $x \equiv 3(\text{mod } 5)$ $x \equiv 6(\text{mod } 7)$	08	L_4	CO2
	b)	Let a, b and c denote integers and let n be a positive integer. Then show that. i) If a ≡ b(mod n), then a + c ≡ b + c (mod n). ii) If a ≡ b (mod n), then ac ≡ bc (mod n).	08	L_1	CO2
Q.5		**Attempt any two of the following**			
	a)	Find the remainder when 10^{241} is divided by 7.	08	L_4	CO3
	b)	Calculate a) $\tau(180)$ b) $\sigma(180)$	08	L_2	CO3
	c)	Prove that σ and τ are multiplicative.	08	L_3	CO3
Q.6		**Attempt any two of the following**			
	a)	If $n = p_1^{k_1}.p_2^{k_2}.p_3^{k_3}.....p_r^{k_r}$ is the prime factorization of $n>1$ then prove that a) $\tau(n)=(k_1+1)\cdot(k_2+1)\ldots\cdot(k_r+1)$ b) $\sigma(n)=\left(\frac{p_1^{k_1+1}-1}{p_1-1}\right)\cdot\left(\frac{p_2^{k_2+1}-1}{p_2-1}\right)\ldots\cdot\left(\frac{p_r^{k_r+1}-1}{p_r-1}\right)$	08	L_3	CO3
	b)	Prove that μ is multiplicative function.	08	L_3	CO3
	c)	Calculate a) $\phi(5040)$ b) $\phi(3000)$	08	L_5	CO3

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