BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc **SEMESTER : III**
BRANCH: MATHEMATICS & COMPUTING **SESSION : MO/2022**

SUBJECT: MA202 MODERN ALGEBRA

TIME: 3:00 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Solve the linear congruence equation $140x \equiv 133 mod 301$. [5]

Q.1(b) Solve the simultaneous congruence equations [5]

$x \equiv 1(mod 3)$
$x \equiv 2(mod 5)$
$x \equiv 3(mod 7)$.

Q.2 (Lagrange's theorem) The order of each subgroup of a finite group is a divisor of the order of the group. [10]

Q.3 (Sylow's first theorem) If p is a prime and p^m divides order of group G, then G has a subgroup of order p^m. [10]

Q.4 If R is a commutative ring with unity, then an ideal M of R is maximal ideal if and only if R/M is a field. [10]

Q.5(a) Show that $\sqrt{-5}$ is a prime element of the ring $Z\sqrt{-5}$. [5]

Q.5(b) Show that the ring of all integers Z is a Euclidean Domain (E.D). [5]

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