This question paper contains 7 printed pages]

5706

M.A./M.Sc. (Sem. II)

Examination, 2018

MATHEMATICS

Paper MATH 2 C(i)

(Advanced Algebra)

Time Allowed : Three Hours

Maximum Marks : 70

Minimum Pass Marks : 28

This question paper will be divided into ***three*** *sections as under :*

Section-A ***Max. Marks-10***

will carry ***10*** *marks with* ***01*** *compulsory question comprising* ***10*** *short answer type questions (maximum* ***20*** *words answer) taking two questions from each unit. Each question shall be of* ***one*** *mark.*

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Section-B ***Max. Marks-25***

will *carry* ***10*** *questions,* ***02*** *questions from each* ***unit (answer*** *about in* ***250*** *words). Students are instructed to attempt* ***five*** *questions by selecting* ***one*** *question from each unit.*

Section-C ***Max. Marks-35***

will carry ***35*** *marks with* ***five*** *long answer* ***type questions*** *comprising* ***one*** *compulsory question* ***(question no. 07)*** *of* ***15*** *marks and* ***four*** *questions of* ***10*** *marks each. Students are instructed to attempt total* ***three*** *questions with* ***one*** *compulsory question (answer* ***about in 500*** *words) and any* ***two*** *more questions (answer about in* ***400*** *words) out of remaining four* ***questions.***

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Section A

1. (i) Find the total number of Homomorphism from group Z_{12} to group Z_{30}

(ii) State Cauchy theorem for finite abelian group.

(iii) Find the normal series of permutation group S_4.

(iv) Define Solvable Group.

(v) Define a Simple Ring.

(vi) Define a Principal Ideal Domain.

(vii) Define a Finite Field Extension.

(viii) Define a Unique Factorization Domain.

(ix) Define a Algebraic Extension.

(x) Define a Perfect Field.

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Section B

UNIT-I

2. Prove that Every Abelian group of order pq is cyclic if p and q are distinct prime.

Or

Prove that A homomorphism $f : G \to G'$ is one-one if and only if $\ker f = \{e\}$ where $\ker f = \{x \in G : f(x) = e\}$

UNIT-II

3. Show that a simple group is solvable if and only if it is Abelian.

Or

Find all the composition series of cyclic group $G = \langle a \rangle$ of order 6 and show they are equivalent.

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UNIT-III

4. Prove that every field is a principal ideal domain but converse need not be true. Give example.

Or

Prove that if F is a field then F(x) is a Euclidean Domain. http://www.uokonline.com

UNIT-IV

5. Show that $J\left[\sqrt{-3}\right]$ is not unique Factorization Domain, where J being the ring of integers.

Or

Let K is an Extension of F and [K : F] = 1, then prove that K = F.

UNIT-V

6. Prove that Every finite extension of a field F is an algebric extension but converse is not true.

Or

Prove that Every finite field is perfect.

Section C

7. Let G be a group and let H and K be normal subgroup of G with $H \subseteq K$, then prove that :

(a) $\frac{K}{H} \triangleleft \frac{G}{H}$

(b) $\frac{G/H}{K/H} \cong \frac{G}{K}$. 5+10=15

8. State and prove Jordan-Holder theorem. 2+8=10

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9. Let a and b be two non-zero elements of a Euclidean domain R. Prove that b is not a unit in R if and only if $d(a) < d(ab)$. 10

10. State and prove Unique Factorization theorem. 2+8=10

11. State the three Sylow theorems and verify them for A_4. 10

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