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KARNATAKA STATE OPEN UNIVERSITY

Mukthagangotri, Mysore – 570 006

Department of Studies in Mathematics

Email: math.ksou@gmail.com

Date: 28 -01-2014

FIRST SEMESTER M.Sc. MATHEMATICS ASSIGNMENTS

(For 2013 – 2014 batch)

Instructions

¤ Answer Any Two Questions in each course and Each Question carry **05 marks**.

¤ Assignment on each course shall be submitted separately.

¤ Assignment shall be in one's own handwriting and be written in A4 size sheet.

¤ On the covering sheet of the assignment write your Name, Register Number and Course

¤ The facing sheet of the assignment shall be in a prescribed format, which may be downloaded from **www.karnatakastateopenuniversity.in**

¤ Using plastic sheets / spiral wires to bind assignment is strictly prohibited.

¤ The assignments submitted after the last date will not be considered for internal assessment marks.

¤ All the assignments shall be put in a single cover and to be submitted by post or in person **on or before 25th March 2014** to the address given below:

The Chairman
DOS in Mathematics
Karnataka State Open University
Mukthagangotri, Mysore -560 006.

Course – 1: Math 1.1Algebra

1. Let $D_4 = \{e,\ a,\ a^2,\ a^3,\ b,\ ba,\ ba^2,\ ba^3\}$ be set of 8 elements. Define the product in D_4 by the relation $a^4 = e$, $b^2 = e$ and $ab = ba^{-1}$. Show that D_4 is a group. Find all subgroups od D_4 and find all left cosets of one of the subgroup of D_4.
2. Define a group homomorphism and Kernel of the homomorphism. State and prove fundamental theorem of homomorphism of groups. Illustrate with example.
3. Define Conjugacy relation; prove that it an equivalence relation. Find the partition of D_4 induced by the Conjugacy relation and hence find the class equation of D_4.

Course – 2: Math 1.2Real Analysis – I

1. Define limit point of a set.Distinguish the limit point of a set and limit of a sequence with illustration. Prove that every infinite bounded set has a limit point.
2. State and prove Cauchy's second theorem on limit of a real sequence. If $a_n = \frac{\lfloor 3n}{(\lfloor n)^3}$ and $b_n = \frac{n^n}{(n+1)(n+2)\cdots(n+n)}$, thenshow that the sequences $\left\{a_n^{1/n}\right\}$ and $\left\{b_n^{1/n}\right\}$ converges and find their limits.
3. State and prove the Cauchy's condensation test and Kummer's test.Illustrate the significance of these testes in finding the convergence of the series.

Course –3: Math 1.3Complex analysis– I

1. Define an analytic function. State the necessary and sufficient condition for the functions to be analytic. Deduce the both Cartesian and Polar form of Cauchy – Riemann equations.
2. State and prove Weierstrass *M*-test.
3. State and prove the following:
   i) Cauchy's theorem for a disk,
   ii) Cauchy's integral formula.
   iii) Taylor's theorem.
   iv) Fundamental theorem of Algebra.

Course –4: Math 1.4 Discrete Mathematics

1. Define Principle Disjunctive Normal Form (PDNF) and Principle Conjunctive Normal Form (PCNF). Describe a method to covert given compound proposition to PDNF and PCNF. Illustrate with examples. What are the applications of PDNF and PCNF?
2. State and prove the Pigeonhole Principle and the Generalized Pigeonhole Principle. Every sequence of $n^2 + 1$ distinct real numbers contains a subsequence of length $n + 1$ that is either strictly increasing or strictly decreasing.
3. Define connectivity relation R^{∞} on *R*.State and explain Warshall's algorithm with illustration.

Course –5: Math 1.5 Differential Equations

1. State and prove Liouville's theorem and hence verify the same for $y''' - y'' - y' + y = 0$ in the interval $[0, 1]$.
2. Deduce Green's formula and verify the same for $y'' + y' + y = 0$.
3. Discuss the series solution of Hermite differential equation. Find the recurrence relation for Hermite polynomials and hence deduce orthogonality of Hermite polynomials.

Facing sheet

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SECOND SEMESTER, M.Sc.Mathematics (2013-14)

ASSIGNMENT

COURSE TITLE:

Name of the candidate	
Roll Number	
Date of Submission	

For Office Use only

Marks Obtained		**Signature of The Evaluator**	