Manipal University Jaipur

Second Sessional Exam. 2016

B.Tech. CSE/IT/CCE III Semester 2016-17

Course: MA1307 Engineering Mathematics III

Question Paper

(OPEN BOOK EXAM)

Time: One hour. **Maximum Marks: 20**

Attempt all the five full questions.

Missing data, if any, be suitably assumed

Marks are shown in [ ]

The exam is open book and open notes. Up to a maximum of THREE items (from among books, handwritten notes and spiral ring binders) is allowed.

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1 (a) Let G be a non-empty set consisting of all the ordered pairs (a, b); $a, b \in R$ and $a \neq 0$. A binary composition $*$ in G is defined as follows

$$(a, b) * (c, d) = (ac - bd, bc + ad).$$

Find the identity element (if it exists) in G with respect to the composition $*$.

(b) Let $f = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \end{pmatrix}$ and $g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 1 & 2 \end{pmatrix}$ be the elements of permutation group S_4. Compute $f^{-1} o g$. [3+2]

2 (a) G is a cyclic group of order 10. If g is a generator of the group G, then state all the other generators of G.

(b) $G = \{f_1, f_2, f_3, f_4\}$, where $f_1(x) = x$, $f_2(x) = -x$, $f_3(x) = \frac{1}{x}$, $f_4(x) = -\frac{1}{x}$, is a group with respect to the composite of functions. Find order of each element of the group G. Is G a cyclic group? State it with justification. [2+3]

3 Use generating function to solve the recurrence relation

$a_r = a_{r-1} + 6a_{r-2}$, $r = 2, 3, 4, \ldots$ with $a_0 = 1, a_1 = 1$. [4]

4 Find the generating function of the discrete numeric function

$$a_r = \begin{cases} (-1)^{r/2}, & \text{if } r \text{ is even} \\ 1, & \text{if } r \text{ is odd} \end{cases}$$

[3]

5 Given that B is a Boolean algebra. Prove or disprove that $x + x.y + x.y.z = x$ for all elements x, y, z of [3]