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- (b) Explain different types of grammar with the help of example.
8. (a) Define Non-Deterministic Finite Automata (NFA) and construct a NFA which accepts all strings that end with 1.
- (b) Describe Mealy machine with the help of example.

M CA. 1st Semester with old notes Maximum Marks
Scheme 80 Examination, December-2015
MATHEMATICAL FOUNDATION OF COMPUTER
SCIENCE
Paper-MCA-101

Time allowed : 3 hours [Maximum marks : 80]

Note : Attempt five questions in all, selecting one question from each unit.

All questions carry equal marks.

1. (a) Prove that the relation R on the set Z of all integers numbers defined by
 $(x,y) \in R \Leftrightarrow X - y$ is divisible by 'n' is an equivalence relation on Z.
- (b) Define composition of function and find (i) fog(2), (ii) gof(1), (iii) fof(3) and (iv) gog(2) when $f : R \rightarrow R; f(x) = x^2 + 8$ and $g : R \rightarrow R; g(x) = 3x^3 + 1$.
2. (a) On Z, the set of integers, a binary operation * is defined by $a * b = a + 3b - 4$. Prove that * is neither commutative nor associative on Z.
- (b) Define a cyclic group. Show that the set $\{1, \omega, \omega^2\}$ is a cyclic group of order 3 with

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67011-P-4 Q-8 (15)

[P.T.O.]

(2)

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generators ω and multiplication, where unity.

with respect to ing the cube root of

3. (a) Let p be "It is hot day" is 45°C ". Write in sim of the following :

be "The temperature ntences the meaning

(i) $\sim p \wedge \sim q$

(ii) $\sim (p \vee \sim q)$

(b) Using truth table p propositions are equiv

that the following to $p \rightarrow q$

(i) $\sim (p \wedge \sim q)$

(ii) $\sim q \rightarrow q$

(c) Prove by constructing $\sim p \rightarrow (p \rightarrow q)$ is

table that tology.

(d) Write the converse ar statement :

erse of the following

If you are mathematic

en you are algebraist.

4. (a) Show that 't' is valid premises

usion from the given

$\sim p \wedge q, r \rightarrow p, \sim$

and $s \rightarrow t.$

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(3)

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(b) Using principle of mathematical induction prove that

$10^{2n-1} + 1$ is divisible by 11 for all values of $n \in \mathbb{N}$.

5. (a) Define partially ordered set. Consider a set $S = \{a, b, c\}$. Is the relation of set inclusion ' \subseteq ' is a partial order on $P(S)$ where $P(S)$ is a power set of S ?

(b) Consider the set $D_{50} = \{1, 2, 5, 10, 25, 50\}$ and the relation divides ($/$) be a partial ordering relation on D_{50} .

(i) Draw the Hasse diagram of D_{50} with relation divides.

(ii) Determine all upper bounds and lower bounds of 5 and 10.

6. Explain the following terms :

(a) Boolean algebra

(b) Bounded Lattice

(c) Distributive Lattice

(d) Complemented Lattice.

7. (a) Find the Language $L(r)$ for the regular expressions:

(i) abb^*a

(ii) $a(a+b)^*ab$

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[P.T.O.]