23/6/16 FN

Reg. No. | | | | | | | | | | | |

Question Paper Code : 27310

5 Year M.Sc. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Software Engineering

ESE055 – THEORY OF COMPUTATION

(Regulations 2010)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Construct a DFA for the regular expression aa*/bb*...
2. Give the DFA accepting the language over the alphabet 0,1 that has the set of all strings that either begins or end(or both) with 01.
3. What is meant by empty production removal in PDA ?
4. Give pumping lemma to prove that given language L is not context free.
5. List out the actions take place in TM ?
6. Define multitape Turing Machine.
7. What is meant by halting problem ?
8. When we say a problem is decidable ? Give an example.
9. Mention the difference between decidable and undecidable problems.
10. Bring the methods for proving NP-Complete Problems.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Let r be a regular expression. Prove that there exists an NFA with e-transitions that accept L(r). **(10)**

(ii) Is the language L = {a b |n = 1} n is regular ? Justify. **(6)**

OR

(b) (i) Construct a DFA equivalent to the NFA. **(10)**

M = ({p,q,r},{0,1}, δ,p,{q,s}), where δ is defined in the following table :

δ	0	1
p	{q,s}	{q}|
q	{r}	{q,r}
r	{s}|	{p}
s	-	{p}

(ii) Define NFA with ε-transition. Prove that if L is accepted by an NFA with ε-transition then L is also accepted by a NFA without e-transition. **(6)**

12. (a) (i) Construct a context free grammar for the given language L = {anbn|/n>= 1} U{amb2m/m>=1} and hence a PDA accepting L by empty stack. **(8)**

(ii) Let G be a grammar s->OB/1A, A->O/OS/1AA B->1/1S/OBB. For the string 00110101, find its leftmost derivation and derivation tree. **(8)**

OR

(b) (i) Construct the PDA for the Language {()*} L = wcw |w is in 0+1 R. **(8)**

(ii) Convert the grammar S->ABb|a, A->aaA|B, B->bAb into greibach normal form. **(8)**

13. (a) (i) Design a deterministic Turing machine to accept the language L = {aibici/i>=0} **(8)**

(ii) Explain Non-Deterministic Turing Machine. **(8)**

OR

(b) (i) Design a Turing Machine M to implement the function "multiplication" using the subroutine 'copy'. **(12)**

(ii) Describe how a Turing Machine with the multiple tracks of the tape can be used to determine the given number is prime or not. **(4)**

14. (a) (i) Define Universal language Lu. Show that Lu is recursively enumerable but not recursive. **(8)**

(ii) Show that "If a language L and its compliment are both recursively enumerable, then both languages are recursive". **(8)**

OR

(b) (i) Show that the following language is not decidable. L={<M>| M is a TM that accepts the string aaab}. **(8)**

(ii) Show that halting problem of Turing Maçhine is undecidable. **(8)**

15. (a) Consider the Turing Machine M and w=01, where M=({ql,q2,q3},{0,l}, {0,l.B},δ,ql,B,{q3}) and δ is given by reduce the above problem to Post's correspondence problem and find whether that PCP has a solution or not. **(16)**

OR

(b) (i) Discuss in detail about any four NP-Complete problems. **(8)**

(ii) Explain the Post's Correspondence Problem with an example. **(8)**
