1. **QUESTION BANK:**

MODULE-1:

MULTIPLE CHOICE QUESTIONS

1. The word 'formal' in formal language means [ ]

a) The symbols used have well define meaning

b) they are unnecessary, in reality

c) Only the form of the string of symbols in significant

d) None of the above

ANS C

2. Languages of a automata is [ ]

a) If it is accepted by automata

b) If it halts

c) If automata touch final state in its life time d) all language are language of automata

ANS A

3. Language of finite automata is [ ]

a) Type 0 b) Type 1 c) Type 2 d) Type 3

ANS D

4.Let A={01},the number of possible strings on length 'n' that can be formed by the elements of the set A is [ ]

a) n!

b) n^2

c) n^n

d) 2^n

ANS D

5. ⟶ The FSM pictured in Fig. recognizes [ ]

a) all strings

b) no strings

c) ε - alone

d)none of above

ANS C

6. Myhill Nerode theorem is consisting of the followings, [ ]

a)L partitions Σinto distinct classes.

b)If L is regular then, L generates finite number of classes.

c)If L generates finite number of classes then L is regular.

d) all of them

ANS D

7. String S is accepted by finite automata if . [ ]

a) δ*(q,s) E A

b) δ(q,s) E A

c) δ*(Q0,s) E A

d) δ(Q0,s) EA

ANS A

8. Which one of the following is an application of finite automata [ ]

a) Scanner

b) Parser

c) Lexical analyzer

d) Semantic analyzer

ANS C

9.δ*(q,ya) is equivalent to [ ]

a) δ((q,y),a)

b) δ(δ*(q,y),a)

c) δ(q,ya)

d) independent from δ notation

ANS B

10. Number of states in MFA where no.of a's divisible by 3, no of b's divisible by 5 and no. of c's not divisible by 6 [ ]

a) 6

b)3

c) 30

d) 90

ANS D

FILL IN THE BLANKS

1. _____. Is a simplest operation on two languages.

(ans: **union**)

2. Number of states requires simulating a computer with memory capable of storing '3' words each of length '8'.is _____.

(ans: 2^(m*n) / **2^(3*8))**

3. Transition function of DFA is _____.

(ans: **Q×∑=Q**)

4. Almost no. of states in NFA and DFA are _____. (ans: $\mathbf{2^n}$)

5. In Mealy machine o/p depends on _____.

(ans: Present input symbol and present state)

6. There are _____ tuples in finite state machine. (ans: **5**)

7. In _____ machine every transition has corresponding output.(ans:**Mealy**)

8. To describe the complement of a language, it is very important to describe the _____ of that

language over which the language is defined.

(ans : **Alphabet**)

9.Finite automata require_____ number of stacks.

(ans: **0**)

10. To examine whether a certain FA accepts any words, it is required to seek the paths from _____ state.

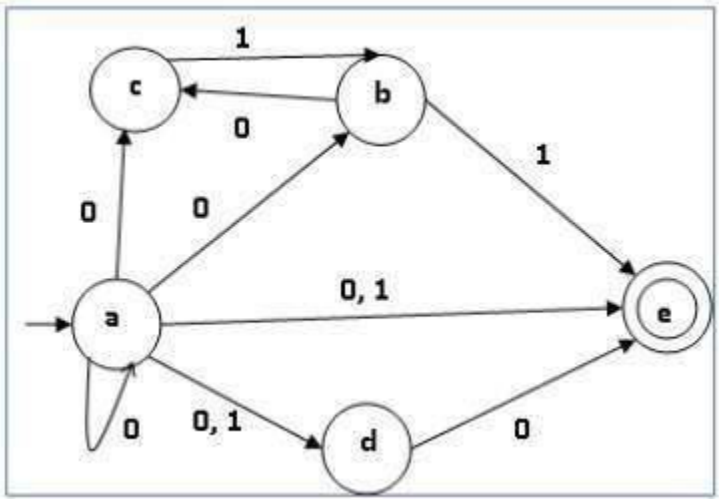
(ans: **initial to final**)

SHORT QUESTIONS

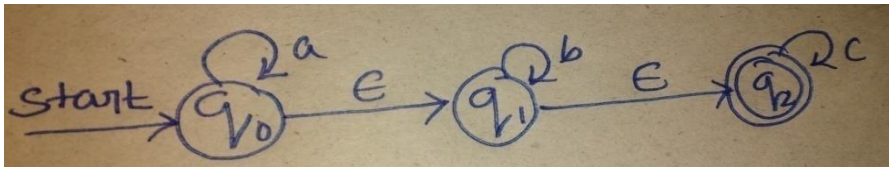
1. Define DFA
2. Mention the differences between DFA, NFA.
3. Construct the DFA that accepts all strings of a's and b's , no a's are even or no.of b's are even .
4. Construct the FA that accepts all strings of a's and b's, that every string starts with a and length of the string not divisible by 3
5. Write down the decision properties of FA.
6. List the differences between Moore and Melay machines.
7. Obtain a DFA to accept strings of a's and b's starting with the string ab
8. List limitations of Finite Automata.
9. Define Moore machine.
10. Obtain a DFA to accept strings of a's and b's having even number of a's and b's

BIG QUESTIONS

1. Convert the following NFA to DFA



2. Convert the following NFA with ε to NFA without ε



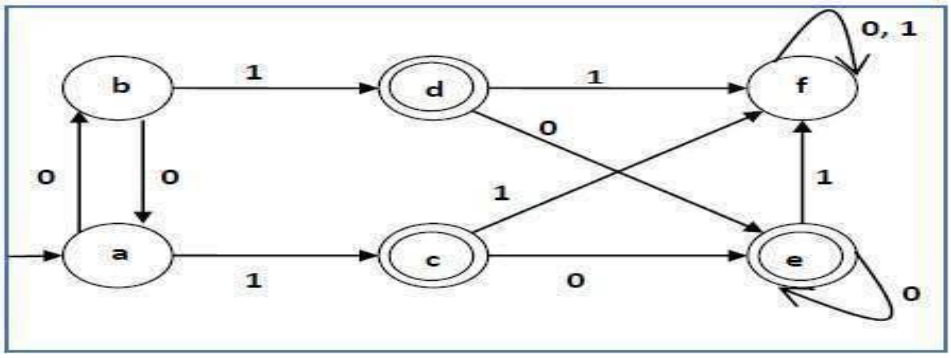
3. a) Define the following i). power of an String ii).Transition Table iii) Language iv) power set

   b).with the help of diagram explain the function of DFA, Why it is called as deterministic?

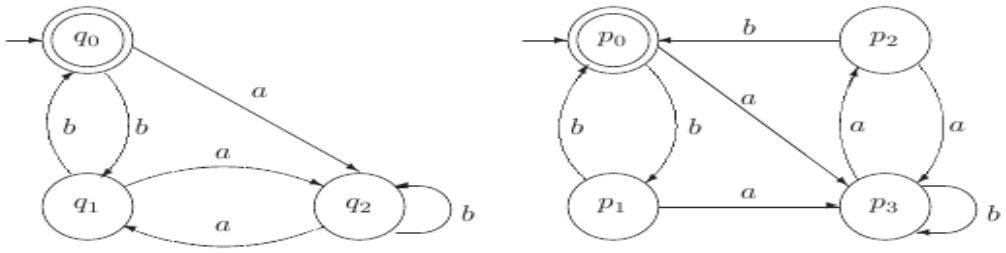
4. a) Draw a DFA to accept string of 0's and 1's ending with the string 011

   b) Obtain a DFA to accept strings of a's and b's having even number of a's and b's.

5. Minimize following DFA.



6. Check whether following two finite automata are equivalent or not.



MODULE-II:

MULTIPLE CHOICE QUESTIONS

1. If L1 and L2 are regular languages is/are also regular language(s) [ ]

a)L1 + L2

b) L1L2

c) L1

d) All the above

ANS D

2. Converting each of the final states of F to non-final states and old non-final states of F to final states, FA thus obtained will reject every string belonging to L and will accept every string, defined over Σ, not belonging to L. is called [ ]

a)Transition Graph of L

b) Regular expression of L

c)Compliment of L

d) Finite Automata of L

ANS C

3. 11.Regular expression for all strings starts with ab and ends with bba is. [ ]

a) ab(b+a)*aba

b) ab(a+b)*bab

c) ab(a+b)*bba

d) None

ANS C

4.Let r and s are regular expressions denoting the languages X andY. Then (zy)denote [ ]

a). X *

b). X Y

c). X +

d). X U Y

ANS D

5 Regular expressions are closed under [ ]

a) Union

b) Intersection

c) Kleen star

d) All of the mentioned

ANS D

6. Let r, s, t are regular expressions. (ε+ r)* = [ ]

a). r *

b). ε r

c). ε

d). r

ANS A

7. 1 + 01 = [ ]

a). ε + 0

b). (ε + 0) 1

c). 1 01

d). 1 (ε + 0)

ANS B

8.Which of the following is not a regular expression? [ ]

a) [(a+b)*-(aa+bb)]*

b) [(0+1)-(0b+a1)*(a+b)]*

c) (01+11+10)*

d) (1+2+0)*(1+2)*

ANS B

9. Let L1 be 0*10 * and L2 be 10*1 The quotient of L1 and L2 is [ ]

a). empty

b). 1

c). 10*

d). 0 *

ANS D

10. Pick the correct statement The logic of pumping lemma is a good example of [ ]

a). iteration

b). Divide and conquer

c). The pigeon hole principle

d). Recursion

ANS D

FILL IN THE BLANKS

1) De-Morgan's law for sets is expressed as_____.

(**Ans:** $\mathbf{L_1'} \cap \mathbf{L_2'})' = L_1 \cup L_2$

2) The languages _____are the examples of non regular languages

(**Palindrome and Prime**)

3) _____- is obviously infinite language.

(**Palindrome**)

4) _____ is a concise notation for denoting regular sets.

(**Regular Expression**)

5) Regular grammar is a subset of _____type grammar .

(**Type 0, 1 and 2**)

6) L= {an bn an | n = 1 , 2 , 3, - - - - } is an example of a _____language

(**ans: not context free**)

7) The production of left linear grammar is of the form _____

(**ANS BW**)

8) Let r , s , t are regular expressions . Φ *_____

({ **ε** })

9) _____ is generally used for proving a given grammar is not regular (**Pumping Lemma**)

10) R*(ε+R)=_____

(**r***)

SHORT QUESTIONS

1. What is regular set and Regular Expression?
2. Simplify the RE (ab*+(ab)*)*a*
3. Construct the RE that generates all the strings of a's and b's i) including ε ii) excluding ε
4. Define CFG, LMD, RMD.
5. Find a RE for the set of all strings containing no three consecutive 0'
6. What is the difference between Regular and context free grammar?
7. Construct a regular grammar for the regular expression a*b(a+b)*
8. List closure properties of regular languages.

9. Prove for the RE a and b

   i. (ab+a)*a=a(ba+a)*

   ii (a*b*)*=(a+b)*

10. Find the left most derivation for the word abba in the grammar

   S□ AA

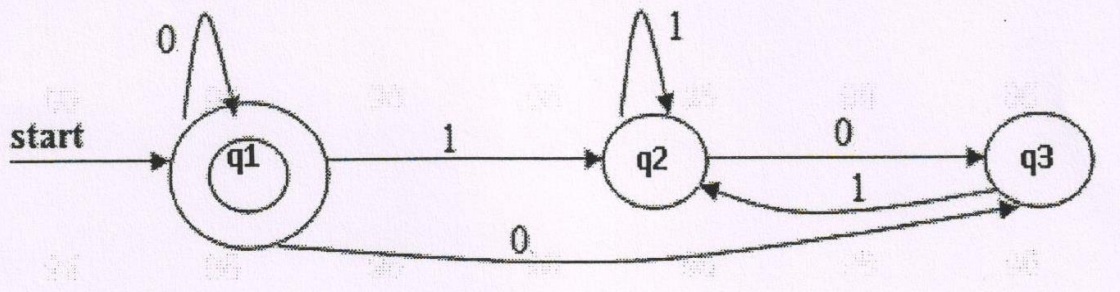
   A□aB

   B□bB/ε

BIG QUESTIONS

1) a) Show that L= { $a^n b^n$| n>=1} is not a regular language using pumping lemma.

b) Derive the RE for the following finite automata



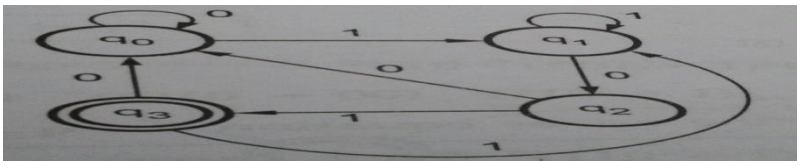
2. a) Construct the RE , where the length of the string is at least 2 and exactly 2

   b) Convert the RE (02+1)* to an NFA-ε

3 a) State and prove pumping lemma for regular languages.

b) Explain the procedure of converting FA to RE with example

4.a) consider the FA and construct RE that accept by the following diagram.



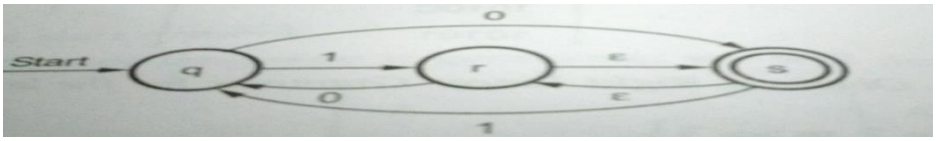
b) Find the RE accepted by the following DFA

5. a) Construct a regular grammar for (ab+a)* (aa+b)

b) Convert the given right linear grammar to equivalent left linear grammar

S□ bB, B□ bC, B□ aB, C□a, B□b

6. a)Find the regular grammar for the FA



b) Explain various components of context free grammar and derivation tree in detail.

MODULE-III:

MULTIPLE CHOICE QUESTIONS

1. NPDA = (S, Σ, Γ, δ, s, X). s belongs to [ ]

a) s

b) δ

c) X

d) S

ANS D

2.The CFL are not closed under [ ]

a) union , intersection

b) Kleene closure

c) intersection, complement

d) complement , Kleen closure

ANS B

3. How many tupils required defining PDA? [ ]

a) 5

b) 4

c) 6

d) 7

ANS D

4. The set {anbn / n=123….} can be generated by the CFG [ ]

a) S□ab|aSb

b) S□aaSbb| ab

c) S□ ab| aSb | ε

d) S□ aaaSbb | ab |aabb

ANS A

5. Consider the following grammar S □ a ABB | aAA, A □ aBB | a, B □ bBB | A In NPDA for above G δ (Q1,b,A) = [ ]

a) (Q1,BB),(Q1,λ)

b) (Q1,BB),(Q1, λ)

c) (Q1,BB)

d) (Q1,ABB),(Q1,AA)

ANS C

6. The language [WW^R] is accepted by [ ]

a) DPDA not by NPDA

b) DPDA and NPDA

c**)** NPDA not by a DPDA

d) none

ANS C

7.Context free languages are closed under ”union” is [ ]

a) can‟t say

b) False

c) True

d) True or False

ANS C

8. Which of the following is accepted by an NPDA and not DPDA [ ]

a) All strings in which a given symbol is present at least twice

b) String ending with a particular alphabet

c) Even palindromes

d) All strings in which a given symbol is present at least thrice

ANS C

9. CFG" stands for [ ]

a)Context Free grammar

b)Context Free Graph

c) Context Finite Graph

d) Context Finite Grammar

ANS B

10. Which of the following is superset to all? [ ]

a) Type 0

b) Type 1

c) Type 2

d) Type 3

ANS A

11. Which of the following pairs have DIFFERENT expressive power? [ ]

a)Deterministic finite automata(DFA) and Non-deterministic finite automata(NFA)

b) Deterministic push down automata (DPDA)and Non-deterministic push down automata(NPDA)

c) Deterministic single-tape Turing machine and Non-deterministic single-tape Turing machine

d) Single-tape Turing machine and multi-tape Turing machine

ANS B

FILL IN THE BLANKS

1. A regular set accepted by DFA with n states is accepted to final state by a DPDA with n states and at least _____pushdown symbols

(**1**)

2. Consider the languages L1 = $\{0^i1^j \mid i != j\}$. L2 = $\{0^i1^j \mid i = j\}$. L3 = $\{0^i1^j \mid i = 2j+1\}$. Then L1, L2 and L3 are _____

(**context free**)

3. The language L= $\{0^i21^i \mid i \geq 0\}$ over the alphabet {0,1, 2} is:_____

(**is recursive and is a deterministic CFL**)

4. Consider the CFG with {S,A,B) as the non-terminal alphabet, {a,b) as the terminal alphabet, S as the start symbol and the following set of production rules

   S□ aB S□bA, A□a, A□aS, S□ aAA

   B□b

   B□bS

   B□bBB generated by the grammar is _____

   (**aabbab**)

5. The language $\{a^m b^n C^{m+n} \mid m, n \geq 1\}$ is _____

(**context free but not regular**)

6. The language accepted by a Pushdown Automation in which the stack is limited to 10 items is best described as_____

(**Regular**)

7. DPDA accepts _____

(**Deterministic CFL**)

8. The production A□B where A€V,B∑(VUT)* is related to _____ grammar.

(**Type2**)

9. The operation of stack is based on _____principle.

(**LIFO**)

10. Let L be a language accepted by a DPDA them _____can also accepted by a DPDA.

(**complement**)

SHORT QUESTIONS

1.prove the grammar is ambiguous.

S□a|Sa|bSS|SSb|SbS

2. Convert the following grammar to Greibach normal form

S□ ABA|AB|BA|AA|B

A□aA|a , B□bB|b

3. construct the PDA for the following grammar

S□AA|a A□SA|b

4. what is DPDA?

5. What are the difference between PDA and DPDA?

6. For the CFG remove the ε production

S□ aSa

S□ bSb

S□ ε

7. Explain Chomsky's normal form with example.

8. Explain Greibach normal form with example.

9. When a CFG is said to be GNF?

10. List out the properties of CFG?

11. Define PDA?

BIG QUESTIONS

1.a) What is Chomsky's normal form explain.?

b) Define CNF . convert the following CFG to CNF

S□ASB| ε , A□aAS|a , B□SbS|A|bb

2. a) What is Greibach normal form explain in details?

b) Convert the given CFG into GNF

S□ CA

A□ a

C□ aB| b

3. a) Explain the pumping lemma for CFL?

b) Explain the properties of CFL.

4. a) Explain PDA ,its model with neat diagram?

b) Design a PDA for accepting a language $\{a^n b^n \mid n>=1\}$

5.a) construct PDA for the language $L=\{a^n b^{2n} | n>=1\}$

b) Define DPDA with example?

6. a) convert PDA for the given CFG S□ 0BB , B□ 0S|1S|0 and test 010^4 is acceptable by this PDA.

b) Design a PDA for the grammar

S□ 0A

A□0AB|1

B□1

MODULE-IV:

MULTIPLE CHOICE QUESTIONS

1. Given Turing machine M, produce a Turing machine M' such that M' halts and accepts x if M loops on x and M' loops otherwise. [ ]

a) Since we can't know if M will halt, we can't know if M' will halt.

b) Since we can't know if M' will halt, we can't know if M will halt.

c) No computer can produce M' from M.

d) none

ANS C

2. Univetrsal language is [ ]

a) Recursive enumerable

b) Non- Recursive enumerable

c)Recursive

d) Non- Recursive

ANS C

3. Set of all TM is **[ ]**

a) Uncountable

b) countable but infinite

c) Finite

d) Void

ANS B

4. The class of TM is equivalent to the class of **[ ]**

a) Type 0

b) Type 3

c) Type 1

d) Type 2

ANS A

5. Turing machines use what as their memory **[ ]**

a) finite tape

b) infinite tape

c) RAM

d) ROM

ANS B

6.Comparing TM and computers we find **[ ]**

a) Both are equivalent

b) They can not be compared

c) TM has more computational power

d) more computational power

ANS D

7. The LBA is a variant of **[ ]**

a) PDA

b) FA

c) TM

d) NFA

ANS C

8. Turing machine is [ ]

a)RL

b) CFL

c) Recursively enumerable language

d) CSL

ANS C

9. Which of the following is not a variant of the standard Turing machine? [ ]

a) LBA

b.)PDA

c) universal Turing machine

d) TM

ANS B

10. LBA (NDTM) =(S, A, δ, S0, Δ L, ΔR, F). the input alphabet is [ ]

a) Δ L

b.)Δ R

c) Δ L, Δ R

d.)δ

ANS C

FILL IN THE BLANKS

1. LBA is _____

   (**restricted TM from both sides**)

2. LBA (NDTM) =(S, A, Δ, S0, Δ L, ΔR, F). δ(Si, ΔR) =_____

   (**Sj, ΔR,L**)

3. The TM halting problem is _____

   (**Unsolvable**)

4. TM use _____ as their memory

   (**Rom**)

5. Every recursive language is _____

   (**Recursive enumerable**)

6. Counter machine is similar to _____

   (**Multi track TM**)

7. Context sensitive grammar is_____

   (**Context sensitive language**)

8. LBA is a NDTM is_____

   (**True**)

9. The union of two Recursive enumerable language is _____

   (**Recursive enumerable**)

10. TM makes move based on _____

    (**current state)**

SHORT QUESTIONS

1. Define Turing Machine?
2. What is Type 1 grammar?
3. Design TM for L={$0^n1^n0^n$|n>=1}
4. Define Recursively enumerable language?
5. Construct TM to add two given integer?
6. What are the types of TM?
7. What are the properties of Recursive and recursively Enumerable language?
8. Define Churchs' s Hypothesis?
9. What are the limitations of TM?
10. Make a comparison between FM,PDA and TM?

BIG QUESTIONS

1)a) Explain TM in Brief?

b) Explain importance and limitations of TM?

2) a) Given ∑ = { 0,1 }, design a TM that accepts the language denoted by regular expression 00*

b) Design A TM that accepts L={a^nb^n |n>=0}

3) a) Explain counter machine in details?

b) make a compare between PDA and TM?

4) a) Explain with diagram for the the working of a TM model?

b) Design a TM that accept L={$0^{2n}1^{n}$|n>=0}

5) a) Construct a Multitrack TM for checking a given number is prime or not?

b) Construct a TM for ∑={a,b} which will covert lower case to upper case letters.

6) a) What is RE ? Explain in details

b) Design a TM to find out 2' compliment of a given binary number?

MODULE-V:

MULTIPLE CHOICE QUESTIONS:

1. MPCP stands for **[ ]**

a) Modified posts correspondence problem

b) Many posts correspondence problem

c) Most posts correspondence problem

d) Merged posts correspondence problem

ANS A

2. Which of the following holds good? **[ ]**

a) P is not in NP

b) NP is not in P

c) P is in NP

d) none

ANS C

3. What version of a problem is used to determine if it is NP hard [ ]

a) Worst case solution

b) Decision problem

c) Optimal solution problem

d) Optimal value problem

ANS B

4. The class of unrestricted language corresponds to [ ]

a. PDA

b. TM

c. LBA

d. FA

ANS B

5. NP hard problem is [ ]

a) Which is harder than NP

b) Which is not in P

c) All NP problems are polynomials reducible

d) Which is in P?

ANS C

6. Recursive is [ ]

a) Decision problem

b) Decidable problem

c) UnDecidable problem

d) none

ANS A

7. Assuming P != NP, which of the following is true ? [ ]

a) NP-complete = NP

b) NP-complete $\cap$ P = ϕ

c)NP-hard = NP

d) P = NP-complete

ANS B

8. Let X be a problem that belongs to the class NP. Then which one of the following is TRUE? [ ]

a). There is no polynomial time algorithm for X

b) If X can be solved deterministically in polynomial time, then P = NP.

c) If X is NP-hard, then it is NP-complete.

d) X may be undecidable

ANS C

9. The problem 3-SAT and 2-SAT are [ ]

a) undecidable and NP-complete respectively

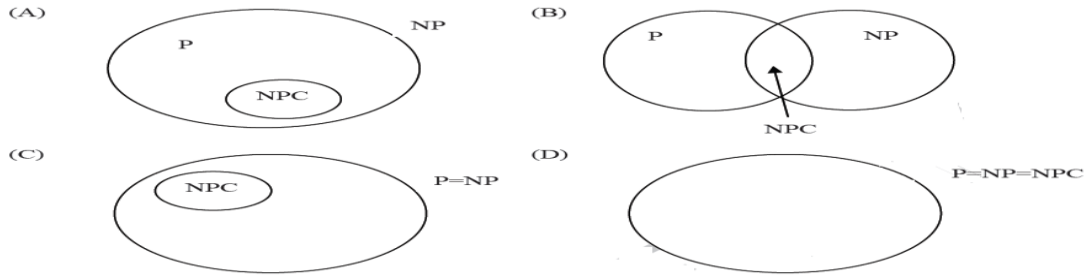
b) undecidable and NP-complete respectively

c) undecidable and NP-complete respectively

d) both in P

ANS B

10. Suppose a polynomial time algorithm is discovered that correctly computes the largest clique in a given graph. In this scenario, which one of the following represents the correct Venn diagram of the complexity classes P, NP and NP Complete (NPC)?



FILL IN THE BLANKS

1. PCP stands for _____

(**Post Correspondence Problem**)

2._____ are those problems can solvable by TM in polynomial time

(**P problem**)

3. _____ are those problems can solvable by non deterministic TM in polynomial time

(**NP problem)**

4. Search problems are _____ problems

(**NP Hard**)

5. If P=NP then NP –complete is in_____

(**P**)

6. MPCP is un decidable problem "is_____

(**True**)

7. Sum of subset problem is_____

(**NP-Hard**)

8. Halting problem is _____

(**undecidable)**

9. LBA stands for_____

(**linear bound Automata**)

10.PCP and MPCP are ____problem

(**undecidabl**e)

SHORT QUESTIONS

1. What is P class?
2. State and explain rice theorem?
3. What are the difference between NP-Hard and NP- complete?
4. What is Hierarchy Theorem?
5. Is the language $a^nb^nc^n$ is context sensitive?
6. What is halting problem is it solvable?
7. Explain halting problem of TM?
8. What is Decidability? Explain with example?
9. Explain Universal TM?

BIG QUESTIONS

1) a) What is P,NP, NP-complete and NP-hard?

b) Explain Chomsky Hierarchy in details?

2. a) What is PCP ? Or Universal TM

b) i) explain Homomorphism ii) Recursive language

3. a) What is Turing Machine and Multi tape Turing Machine? Show that the languages accepted by these machines are same.

b) What is decidability of a problem explain in details?

4. a) Design Turing Machine for the language to accept the set of strings with equal number of 0's and 1's and also give the instantaneous description for the input '110100'.

b) What is halting problem and Turing reducibility ?

5. a) Define LR(0) grammars.

b) Give examples for Undecidable Problems

6 .a) Write a shot notes on post's correspondence problem and check the following is PCP or not.

I	A	B
1	11	111
2	100	001
3	111	11

b) Write short notes on

i) Multi tape Turing Machine

ii)Chomsky hierarchy.