

8YBSE-C.S  
III-sem  
 Theory of  
 Computations

19/10/19

Max Time: 2½hrs

Max Marks: 75

Instructions:

- 1) All questions are compulsory.
- 2) Mixing of sub questions is not allowed.
- 3) Write in clear, legible, writing.

**Q I**

Answer the following

**15  
05**

**A) Choose the correct option**

- 1) NFA can be converted to DFA.  
 a) True      b) False
- 2) Transition function of DFA is given by:  
 a)  $\Sigma \times Q \rightarrow \Sigma$     b)  $Q \times Q \rightarrow \Sigma$     c)  $\Sigma \times \Sigma \rightarrow Q$     d)  $Q \times \Sigma \rightarrow Q$
- 3) What is regular expression matching zero or more specific character?  
 a) \*      b) +      c) ^      d) -
- 4) TM is more powerful than \_\_\_\_  
 a) FA      b) PDA      c) none      d) both a and b
- 5) If a problem has an algorithm to answer it, we call it \_\_\_\_  
 a) decidable    b) solved    c) both a and b    d) none of the mentioned

**B) Fill in the blanks**

**05**

( PDF, PDA, non-regular, regular, begin, 4, 5, initial )

1. There are \_\_\_\_ tuples in finite state machine.
2. In FA the start state is also called as \_\_\_\_ state.
3. If  $L1$  is a regular language, its kleen closer  $L1^*$  will also be \_\_\_\_
4. The set  $L = \{0^i 1^j | i \geq 1\}$  is \_\_\_\_
5. \_\_\_\_ is a graphical representation is used for modeling the CFG.

**C) Answer in one or two sentences**

**05**

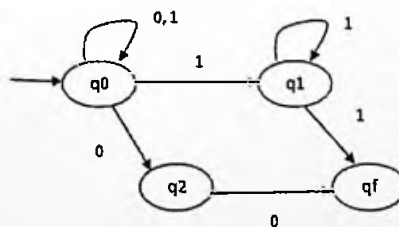
1. What is Moore machine?
2. What is DFA?
3. Who invented TM?
4. TM can be represented using?
5. Grammar consists of how many tuples?

**Q II**

Attempt any three

**15**

- A) Define an automaton. What are its components?
- B) Explain the term DFA and NFA in detail.
- C) Design FA which accepts even number of 0's and even number of 1's
- D) Obtain DFA equivalent to NFA



- E) Convert the following Moore machine into equivalent Mealy machine  $M = (\{q_0, q_1\}, \{a, b\}, \{0, 1\}, \delta, \lambda, q_0)$

$\delta$	a	b	$\lambda$
$q_0$	$q_0$	$q_1$	0
$q_1$	$q_0$	$q_1$	1

- F) Construct the regular expression for the following:
- RE containing even number of 0's.
  - RE that generates odd numbers of 1's.
  - RE to generate a string containing a substring aba.

**Q III** Attempt any **three**

15

- Define the term regular grammar and hence explain left linear and right linear grammar.
- State and prove Arden's theorem.
- Construct the RE corresponding to the following transition diagram using Arden's theorem.



- What is derivation tree? Give suitable example.
- Construct CFG without  $\epsilon$  production from the one given below  
 $S \rightarrow a|Ab|aBa$   
 $A \rightarrow b|\epsilon$   
 $B \rightarrow b|A$
- Write a short note on Pushdown automaton

**Q IV** Attempt any **three**

15

- Explain Universal Turing machine.
- construct a TM for the language of even number of 1's and even number of 0's over  $\Sigma = \{0, 1\}$
- Write a note on unsolvable problem.
- Write a note on method of a LBA.
- What is Turing machine? Explain its composition and operations.
- Write a note on variants of Turing machine.

**Q V** Attempt any **three**

15

- Explain Chomsky classification of grammar in detail.
- Prove  $(1+00^*1)+(1+00^*1)(0+10^*1)^*(0+10^*1)=0^*1(0+10^*1)^*$
- Explain Pumping Lemma for CFG.
- Write a short note on halting problem.
- Design a Turing machine the accepts  $\{0^n 1^n | n \geq 1\}$

Instructions:

- 1) All questions are compulsory.
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- 3) Write in clear, legible, writing.

Q1 Answer the following :&lt; from all units&gt;

(15)

A) Choose the correct option

(5)

1). which of the following is not true about the exception handling section of a PL/SQL block?

- a) This section starts with the EXCEPTION keyword.
- b) It is a mandatory section.
- c) It contains exception(s) that handle errors in the program.
- d) None of the above.

2). what is wrong in the following code snippet?

```
DECLARE
  x number := 1;
BEGIN
  LOOP
    dbms_output.put_line(x);
    x := x + 1;
    IF x > 10 THEN
      exit;
    END IF;
    dbms_output.put_line ('After Exit x is: ' || x);
  END;
```

- a) There is nothing wrong.
- b) The IF statement is not required.
- c) There should be an END LOOP statement.
- d) The exit statement should be in capital letters.

Q.3: - Observe the syntax given below -

```
CREATE [OR REPLACE] TRIGGER trigger_name
(BEFORE | AFTER | INSTEAD OF)
{INSERT [OR] | UPDATE [OR] | DELETE}
[OF col_name]
ON table_name [REFERENCING OLD AS o NEW AS n] [FOR EACH ROW]
WHEN (condition)
DECLARE
  Declaration-statements
BEGIN
  Executable-statements
EXCEPTION
  Exception-handling-statements
END;
```

The {INSERT [OR] | UPDATE [OR] | DELETE} clause specifies a

- a) DDL operation.
- b) DML operation.
- c) None of the above.
- d) Both of the above.

Q.4: - Which keyword is used instead of the assignment operator to initialize variables?

- a) NOT NULL

- b) DEFAULT
- c) %TYPE
- d) %ROWTYPE

Q.5: - PL/SQL programs are written as lines of text using a specific set of characters.

- a) Upper- and lower-case letters A .. Z and a .. z
- b) Numerals 0 .. 9
- c) Symbols ( ) + - \* / < > = ! ~ ^ ; : . ' @ % , " # \$ & \_ | { } ? [ ]
- d) Tabs, spaces, and carriage returns
- e) All mentioned above

B). Fill in the blanks (Triggers, Function, Transaction, Rollback, Tempdb, Index entry, rollback, commit) (5)

1. A \_\_\_\_\_ is a special kind of a store procedure that executes in response to certain action on the table like insertion, deletion or updation of data.
2. A \_\_\_\_\_ consists of a sequence of query and/or update statements.
3. \_\_\_\_\_ will undo all statements up to commit?
4. Temporary stored procedures are stored in \_\_\_\_\_ database.
5. An \_\_\_\_\_ consists of a search-key value and pointers to one or more records with that value as their search-key value.

C). Answer in one or two sentences (5)

1. What is schema?
2. What is Index Cluster?
3. Rollback
4. What are sequences?
5. Instead of

Q II Attempt any three (15)

- A) . Explain 3 basic parts of a trigger.
- B) . Explain Stored Procedure? Discuss how to create procedure in PL\SQL with example.
- C) . Write a short note on using insert clause used in trigger using before/after clause by giving example.
- D) . How to create Index? Explain with example.
- E) . Explain Heap File Organizations.
- F) . Employees of the testing department in the Perpetual Systems does testing of the software and result is taken as test-id, test-name, date\_of\_testing, test\_result. Execute The procedure to insert the values in the table "Testing".

Q III Attempt any three (15)

- A) . What Is PL/SQL? Introduction & Architecture.
- B) . Explain the role of Null value in PL\SQL with example.
- C) . Write a PL/SQL Program to Find Greatest of Three Numbers using if Else statement.
- D) . Explain while loop with example.
- E) . Write a procedure that accepts a score (between 0 and 100) and then grades that score according to the rules below. Give a suitable output message.

- 80 -100: Grade A
- 60 - 79: Grade B
- 40 - 59: Grade C
- 20 - 39: Grade D
- <20: Grade E

F) Explain %type and record in P.L\SQL.

Q IV Attempt any three

(15)

- A) . Explain shadow paging and log based recovery scheme.
- B) .Describe Aries Algorithm.
- C) .Explain State cycle of Transaction system.
- D) . Define log. What are the contents of log record?
- E) .What is ACID? What does each property say with respect to the execution of Transaction?
- F) .Explain Two Phase commit protocol

Q V Attempt any three <from all the units>

(15)

- A) .Explain PL/SQL expressions.
- B) . Creating simple Sequences with clauses like START WITH, INCREMENT BY, MAXVALUE, MINVALUE, CYCLE | NOCYCLE, CACHE | NOCACHE, ORDER | NOORDER.
- C) . What is Trigger? Explain benefits of Trigger.
- D) . Explain Transaction System.
- E) Create a trigger that is fired after an INSERT statement is executed for the Customer table. The trigger writes the new customer's code, name and the sysdate in a table called Customer\_Log.(create the table Customer\_Log)
- F) . Explain undo and redo phase in Aries Algorithm

Max Time: 2½ hrs

Max Marks: 75

**Instructions:**

- 1) All questions are compulsory.
- 2) Mixing of sub questions are not allowed.
- 3) Write in clear, legible, writing.

**Q I Answer the following:**

(15)

**A) Choose the correct option**

(5)

1. The systems which allows only one process execution at a time, are called
  - a) uniprogramming systems
  - b) uniprocessing systems
  - c) unitasking systems
  - d) none of the mentioned
2. The most optimal scheduling algorithm is
  - a) FCFS – First come First served
  - b) SJF – Shortest Job First
  - c) RR – Round Robin
  - d) None of the mentioned
3. Aging'is :
  - a) keeping track of cache contents
  - b) keeping track of what pages are currently residing in memory
  - c) keeping track of how many times a given page is referenced
  - d) increasing the priority of jobs to ensure termination in a finite time
4. When using counters to implement LRU, we replace the page with the :
  - a) smallest time value
  - b) largest time value
  - c) greatest size
  - d) none of the mentioned
5. Termination of the process terminates
  - a) first thread of the process
  - b) first two threads of the process
  - c) all threads within the process
  - d) no thread within the process

**Fill in the blanks:-**

[wakeup() , system calls , old , throughput , thrashing , interprocess communication, cooperating, kernel ]

(5)

1. The request and release of resources are called \_\_\_\_\_.
2. The number of processes completed per unit time is known as \_\_\_\_\_.
3. \_\_\_\_\_ process can be affected by other processes executing in the system.
4. Communication between two processes is called \_\_\_\_\_.
5. If a process spends a lot of time in paging than executing then it is called as \_\_\_\_\_.

**B) Answer in one or two sentences :-**

(5)

1. What is time slice in OS.
2. Explain buffering.
3. What is File System.
4. What do you mean by thread.
5. What is ready queue.

**Q II Attempt any three :-**

(15)

- A) Explain in details the external fragmentation.
- B) What are the differences between distributed and clustered operating system?
- C) What are the differences between multiprocessing and multiprogramming?
- D) Define operating system and list the basic services provided by operating system.
- E) What are the types of System calls?
- F) Explain process states and process control block in details.

**Q III Attempt any three :-**

(15)

- A) Explain and differentiate between user level and kernel level thread.
- B) Explain deadlock avoidance using banker's algorithm in details.
- C) What is deadlock? Explain deadlock detection with multiple resources of each type.
- D) What are the conditions for deadlock? Explain recovery in detail.
- E) Explain Peterson's solution for achieving mutual exclusion.
- F) Explain the following terms :
  - a) Critical section
  - b) context switch

**Q IV Attempt any three :-**

(15)

- A) What is virtual memory? How it is implemented.
- B) Explain linked list allocation & index allocation in detail.
- C) What are the typical access rights that may be granted or denied to a particular user for a particular file?
- D) Explain following allocation algorithm. a. First fit b. Best fit c. Worst fit
- E) What is segmentation? Explain the basic segmentation method.
- F) What is paging? Discuss basic paging technique in details.

**Q V Attempt any three :-**

(15)

- A) What are the different scheduling Algorithm. Explain in brief each one of it.
- B) What is semaphore? Discuss producer-consumer problem with semaphore.
- C) Explain the Disk Scheduling in brief.
- D) Explain the Multithreading model in brief.
- E) What is demand paging? Explain it with address translation mechanism used. What are its specific advantages? How a page table is implemented?

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## Physical Computing (2 ½ Hours)

[Total Marks: 75]

- N.B. 1) All questions are compulsory.  
 2) Figures to the right indicate marks.  
 3) Illustrations, in-depth answers and diagrams will be appreciated.  
 4) Mixing of sub-questions is not allowed.

**Q. Attempt All (Each of 5Marks)**

(15M)

**(a) Multiple Choice Questions**

1. MQTT stands for \_\_\_\_\_  
 a) MQ Telemetry Things    b) MQ Transport Telemetry  
 c) MQ Transport Things    d) MQ Telemetry

2. MQTT is \_\_\_\_\_ protocol.  
 a) Machine to Machine    b) Internet of Things  
 c) Machine to Machine and Internet of Things  
 d) Machine Things

3. Raspberry Pi was invented for.  
 a. security purpose  
 b. Spy purpose  
 c. education purpose  
 d. entertainment purpose

4. The Camera in Raspberry Pi can be attached by \_\_\_\_\_ interface.  
 a. CSI and USB    b. Digital camera    c. SLR    d. DSLR

5. LED stands for \_\_\_\_\_  
 (a) Light Emitting Diode    (b) Light End Diode    (c) Light Effecting Diode

**(b) Fill in the blanks**

{2, Hard Disk, do not connect, cross compiler, do not communicate, 5, 10, monitor, connecting }

1. DASH7 provides multi-year battery life, range of up to \_\_\_\_\_ km.  
 2. The disadvantage of Raspberry Pi is, it does not have a \_\_\_\_\_ associated with it  
 3. The breadboard is a way of \_\_\_\_\_ electronic components to each other without having to solder them together.  
 4. In GPIO, DNC stands for \_\_\_\_\_.  
 5. A \_\_\_\_\_ is a compiler that runs on one platform/architecture but generates binaries for another platform/architecture

**(c) Answer in 1 – 2 sentences**

1. What is GND in GPIO.  
 2. State the full form of ASIC.  
 3. Objective of 3-stage pipeline organisation.  
 4. What is SenseIoT  
 5. What is REST ?



- Q.2 Attempt the following (Any THREE) (15M)**
- (a) Define Raspberry pi.
  - (b) Write a short note on APU
  - (c) What is SoC? Discuss the structure of SoC.
  - (d) Explain Compute Unit with block diagram.
  - (e) Define steps of configuring boot sequence and hardware.
  - (f) Define SoC products and explain FPGA.

- Q.3 Attempt the following (Any THREE) (15M)**
- (a) Discuss any one Programming interface used with Raspberry Pi
  - (b) Write a short note on free open source Raspbian OS.
  - (c) Explain the following Linux commands: rmdir, touch, mv, cp, chmod
  - (d) What is node.js? Explain benefits of node.js.
  - (e) Define and explain with an example Pulse Width Modulation.
  - (f) What is python? Explain its features?

- Q.4 Attempt the following (Any THREE) (15M)**
- (a) Write a short note on Security tools for IoT.
  - (b) Explain XMPP protocol used in IoT communication with block diagram.
  - (c) What is the role of CoAP protocol in IOT.
  - (d) Write a python program and diagrammatically represent circuit connection to blink an LED using raspberry pi kit.
  - (e) Explain the following tools:
    - i. VPN
    - ii. Standard certificates and encryption.
  - (f) Discuss any two real time applications of Raspberry Pi.

- Q.5 Attempt the following (Any THREE) (15M)**
- (a) Explain ARM8 architecture with block diagram.
  - (b) Explain following terms:
    - i. Booth multiplier
    - ii. Register file
  - (c) Explain IoT security in detail.
  - (d) Explain GPIO
  - (f) Explain Carriots as IoT service platform in embedded designing.
-

SY-CS  
Web Prog.

Sem-III

17/10/19

Max Time: 2½hrs

Max Marks: 75

Instructions:

- 1) All questions are compulsory.
- 2) Mixing of sub questions is not allowed.
- 3) Write in clear, legible, writing.

- Q I** Answer the following 15
- A)** Choose the correct option 05
- 1) There are \_\_\_ types of heading available in HTML.  
a)5                      b)6                      c)7                      d)4
  - 2) An unordered list starts with \_\_\_ tag.  
a)<ul>                      b)<ol>                      c)<li>                      d)<ulist>
  - 3) A variable that is declared outside a function definition is a \_\_\_ variable.  
a) local                      b)static                      c)universal                      d)global
  - 4) A regular expression is a sequence of characters that forms a \_\_\_ patterns.  
a)design                      b)arbitrary                      c)natural                      d)search
  - 5) This is called exit checking loop.  
a)do-while                      b)while                      c)for                      d)foreach
- B)** Fill in the blanks 05  
(DTD, foreach, while, <map>, <pre>, <for>, \$, <img>)
1. The \_\_\_ tag is used to define client side image map.
  2. \_\_\_ indicates the browser that the text is preformatted not to be formatted again.
  3. A \_\_\_ statement executes its statements as long as specified condition evaluates to true.
  4. \_\_\_ check vocabulary and validity of the structure of XML documents against grammatical rules of appropriate language.
  5. Variable starts with \_\_\_ in php.
- C)** Answer in one or two sentences 05
1. What is inline CSS?
  2. What is the use of jump statement?
  3. What do you mean by AJAX?
  4. What is XML?
  5. What is regular expression?
- Q II** Attempt any three 15
- A) Explain text formatting tags in details.
  - B) What are the types of lists? Explain with the help of example.
  - C) What is an image map? Explain with the help of example.
  - D) How to use audio – video files in HTML?
  - E) Explain the term Inline, Internal and External CSS in detail.
  - F) Write on CSS properties for positioning an element with the help of example.
- Q III** Attempt any three 15
- A) Write a short note on scope of JavaScript variables.
  - B) Discuss various looping statement in JavaScript.
  - C) Explain switch case statement in detail.

- D) Explain the importance of jump statements in JavaScript.
- E) What is XML? What are the advantages and disadvantages of XML?
- F) What is DTD? Discuss the different types of DTD?

**Q IV** Attempt any three

15

- A) Explain in detail how AJAX works?
- B) Write a short note on XMLHttpRequest Object.
- C) What is control flow statement in PHP? Explain with the help of example.
- D) Define entry checking loop with the help of example.
- E) How to insert, update a record in database?
- F) Write a PHP program to generate all even numbers between 1 to 100.

**Q V** Attempt any three

15

- A) Discuss how to handle asynchronous requests using AJAX?
- B) What is session? How to destroy it?
- C) What is a file? Give the various modes of opening a file.
- D) Write JavaScript code to find factorial of given number.
- E) Write note on for each, give example.

Instructions:

- 1) All questions are compulsory.
- 2) Mixing of sub questions are not allowed.
- 3) Write in clear, legible, writing.

Q I Answer the following: <from all units> (15)

- A) Choose the correct option (5)
- 1) The size of double data type in bits is  
a) 16            b) 32            c) 64            d) None of the above
  - 2) The tool used to run Java programs is  
a) javac        b) java        c) jre            d) None of the above
  - 3) Method invoked before destroying an object is  
a) final        b) finally        c) destructor        d) None of the above
  - 4) valueOf() method belongs to class  
a) System      b) Number      c) String        d) None of the above
  - 5) Interface used for serialization is  
a) Serialize    b) Serialization    c) Serial        d) None of the above

B) Fill in the blanks (default, toString, overloading, static, this, overriding, layout manager, super, int) (5)

1. Methods that perform common tasks and do not require objects are called \_\_\_\_\_ methods.
2. It's possible to have several methods with the same name that each operate on different types or numbers of arguments. This feature is called method \_\_\_\_\_.
3. An object's \_\_\_\_\_ method is called implicitly when an object appears in code where a String is needed.
4. A(n) \_\_\_\_\_ arranges GUI components in a Container.
5. Subclass constructors can call superclass constructors via the \_\_\_\_\_ keyword.

C) Answer in one or two sentences (5)

1. Explain use of garbage collector.
2. Explain the use of finalize method.
3. Give two methods of Map interface.
4. Name two classes in the java.lang package.
5. Name the package used for handling events.

Q II Attempt any three (15)

- A) Explain the portability and object-oriented features of Java programming language.
- B) Explain with examples the different data types.
- C) Explain Relational operators in Java programming language with the help of examples.
- D) Explain the post and pre increment/decrement operators in Java.

- E) Write a program in Java to encapsulate a solid sphere. Provide appropriate constructor and methods to return the volume of a sphere. Create an object in main and show the usage of the above method.
- F) Write a program in Java to check whether the argument is a prime number or not.

**Q III Attempt any three**

(15)

- A) Explain the exception handling mechanism in Java.
- B) Explain the thread lifecycle in Java.
- C) Write a note on Serialization in Java.
- D) Explain the Socket class in Java.
- E) Write a program in Java which creates two threads displaying 'Hello' and 'World' respectively.
- F) Write a program in Java which displays itself.

**Q IV Attempt any three**

(15)

- A) Explain the Integer wrapper class with examples.
- B) Explain ActionListener interface for event handling and their methods.
- C) Explain five methods of Collection interface.
- D) Explain anonymous inner class in context of event handling.
- E) Write a program in Java which creates a frame with labels and textfield and textarea components. It has one button. On the click of the button the content of the textfield should be displayed in the textarea.
- F) Explain the textfield and textarea components.

**Q V Attempt any three <from all the units>**

(15)

- A) Explain package creation and package access in Java.
- B) Explain abstract class in Java with examples.
- C) Explain the Character wrapper class with examples.
- D) Explain how synchronization is achieved in Java threads.
- E) Write a note on Collection Framework.

**Instructions :-**

- 1) All questions are compulsory.
- 2) Mixing of sub questions are not allowed.
- 3) Write in clear, legible, writings.

**Q.1 Answer the following :( Any three) (15)**

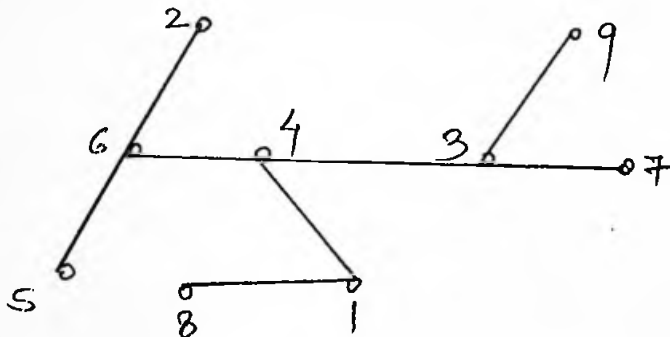
- a. Give a chromatic number of  $C_n$ ,  $P_n$ ,  $E_n$  and  $K_m \times n$
- b. Prove, if  $n$  is non-negative integer then,

$$\binom{2n}{n} = \sum_{k=0}^n \binom{n}{k}^2 = \binom{n}{0}^2 + \binom{n}{1}^2 + \dots + \binom{n}{n}^2$$

- c. Represent  $K_4$  in a planar representation.
- d. Prove that,  $n^4 + n^3 - 2n^2$  is always even for any  $n \in \mathbb{N}$ .
- e. Explain Matching in Bipartite Graphs
- f. Explain flows and cuts.

**Q.2 Answer any three of the following : (15)**

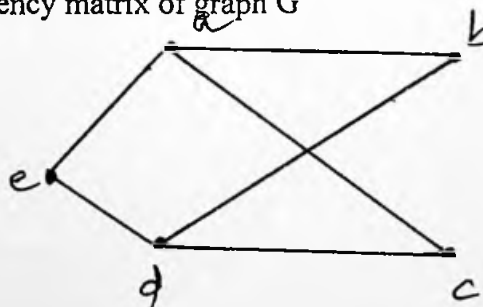
- a. How many different rearrangements of the string RASANAKAMROHTRUP !! are possible if all letters and characters must be used ?
- b. Prove that,  $2^{2n} - 1$  is divisible by 3.
- c. Explain how combinatorics and geometry relate with each other ? Give an example.
- d. Find prifer (T) of tree as shown in Fig. 1.



- e. What are the basic notations and terminologies used in network flow ?
- f. Explain the coloring of vertices.

**Q.3 Answer any three of the following : (15)**

- a. Find adjacency matrix of graph G



- b. Prove Pascal's identity,  $\binom{n}{r} = \binom{n-1}{r-1} + \binom{n-1}{r}$

- c. Show that if any five numbers from the set  $1, 2, \dots, 8$  are chosen, then two of them will add up to 9.
- d. Prove that  $R(n, n) \geq \frac{n}{e\sqrt{2}} 2^{\frac{1}{2}}$
- e. How the labeling algorithm halts ?
- f. What are the basic notations and terminologies used in network flow.

**Q.4 Answer any three of the following : (15)**

- a. Find coefficient of  $x^5 y^7$  in  $(3x - 2y)^{12}$
- b. If  $u_1 = 3, u_2 = 5, u_n = 3u_{n-1} - 2u_{n-2}$  for  $n \geq 3$ .  
Then using induction, show that,  $u_n = 2^n + 1 \forall n \geq 3$ .
- c. State and prove Erdos Theorem
- d. Define what is combination also prove the formula.
- e. Give the concrete example of Ford-Fulkerson labeling algorithm.
- f. How the labeling algorithm halts ?

**Q.5 Answer any three of the following : (15)**

- a. Find coefficient of  $x^5 y^7$  in  $(3x - 2y)^{12}$
- b. Prove that,  
 $1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + 3 \cdot 4 \cdot 5 + \dots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4}$
- c. Prove that  $R(n, n) \geq \frac{n}{e\sqrt{2}} 2^{\frac{1}{2}}$
- d. Define what is string and give an example.
- e. Explain the coloring of vertices.
- f. Explain the relation between flows and cuts?

