SYMBIOSIS INTERNATIONAL (DEEMED UNIVERSITY)

(Established under Section 3 of the UGC Act, 1956)
Re-accredited by NAAC with 'A' Grade (3.58/4) Awarded Category – I by UGC

Seat No. | | | | | | |

Institute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070121) BACHELOR OF TECHNOLOGY
Computer Science and Engineering

Batch: 2014-18,2015-19,2016-20

Semester: IV

Course: Operating Systems

Course Code: 0701220402CS

ESE
CS - 2018 - April
Sem - IV

Date: 08/05/2018

Day: Tuesday

Maximum Marks: 45

Time: 09:45 am - 11:15 am

Instructions:

1. **All questions are compulsory**
2. **Draw neat diagrams wherever required**

Q.1 **a)** Describe how operating system is loaded in the computer system and what functions /services are provided by the OS. **5**

b) Discuss the essential difference between multitasking, multiprogramming and multiuser operating systems. **3**

Q.2 **a)** Discuss various multithreading models and also mention the issues of threading. **5**

OR

a) Explain the structure of Process Control Block (PCB) and its significance when CPU switches from one user to another. **5**

b) Illustrate the Gantt chart and calculate the average waiting time using following algorithms and below given set of processes: **5**

i) SJF(non-Preemptive)
ii) SJF(Preemptive)
iii) Round Robin (quantum=2)

Process	Arrival Time	Burst Time
P1	0	6
P2	1	2
P3	2	5
P4	3	7
P5	7	1

Q.3 **a)** Classify in detail various deadlock avoidance schemes and answer the following question: **5**

There are three processes P1, P2 and P3 sharing a semaphore for synchronizing a variable. Initial value of semaphore is one. Assume that negative value of semaphore tells us how many processes are waiting in queue. Processes access the semaphore in following order:

i) P2 needs to access
ii) P1 needs to access
iii) P3 needs to access
iv) P2 exits critical section
v) P1 exits critical section

The final value of semaphore will be _____ and why?

b) Demonstrate the Monitor implementation of producer- consumer code and answer the following: **5**

Consider the procedure below for the producer-consumer problem which uses semaphores:

```
semaphore n = 0;
semaphore s = 1;
void producer()
{
      while(true)
      {
       produce();
       semWait(s);
       addToBuffer();
       semSignal(s);
       semSignal(n);
      }
}
```

```
void consumer()
{
      while(true)
      {
       semWait(s);
       semWait(n);
       removeFromBuffer();
       semSignal(s);
       consume();
      }
}
```

Which one of the following is TRUE?

i) The producer will be able to add an item to the buffer, but the consumer can never consume it.

ii) The consumer will remove no more than one item from the buffer.
iii) Deadlock occurs if the consumer succeeds in acquiring semaphore s when the buffer is empty.
iv) The starting value for the semaphore n must be 1 and not 0 for deadlock-free operation.

Q.4 **a)** Describe the role of valid –invalid bit in the implementation of page fault handling schemes. **5**

OR

a) Explain shared and inverted pages in detail with proper example **5**
Inverted pages

b) Given the following stream of page references by an application, calculate the number of page faults the application would incur with FIFO, LRU and OPT page replacement algorithms. Page frame size = 3. **3**

Reference stream: A B C D A B E A B C D E B A B

Q.5 Distinguish between various directory structures. **4**

Q.6 Suppose that the head of a moving head disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 143. The queue of requests is kept in the FIFO order as: 86, 147, 91, 177, 94, 150, 102, 175, 130. **5**
Estimate the total number of head movements needed to satisfy these requests for the following disk-scheduling algorithms:

i) LOOK
ii) C-SCAN
iii) SCAN

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Institute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070121) BACHELOR OF TECHNOLOGY
Computer Science and Engineering, Information Technology

Batch: 2012-16,2013-17,2014-18,2015-19,2016-20

Semester: IV

Course: Microprocessor Techniques

Course Code: 0701220406CS,0701240406IT

Date: 12/05/2018 **Maximum Marks:** 45

Day: Saturday **Time:** 09:45 am - 11:15 am

Instructions:

1. **All questions are compulsory.**
2. **Use of calculator is allowed.**

Q.1 **a)** Discuss pictorially each block in the architecture of 8086 and explain functionality of BIU. **5**

b) Draw and explain minimum based system of 8086. **10**

Q.2 What are the 4 errors an assembler would list for the following program snippet? Explain instructions – CALL and LEA. **10**

```
Call acc                    cont...
mov si, arr1                proc acc near
mov di, arr2                lea si, str
mov cx,0004h                mov al,0Ah
repe movs                   int 21h
jz down                     ret
cont...                     endm
```

Q.3 Design command words for 8259 based system for following specifications : Total number of interrupts are 25, Interrupt type 36, edge triggered, cascaded mode, ICW4 needed, Auto end of interrupt, Special fully nested mode. Draw complete interfacing diagram of 8086 and 8259. **10**

Q.4	Design the command word for interfacing 4X4 matrix keyboard to 8086 with 8255 and draw the interfacing diagram.	**5**
Q.5	Explain FSQRT instruction and discuss the features of 8087.	**5**

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Institute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070121) BACHELOR OF TECHNOLOGY
Computer Science and Engineering, Information Technology

Batch: 2012-16,2013-17,2014-18

Semester: IV

Course: Engineering Mathematics III

Course Code: 0701210401CS,0701210401IT

Date: 10/05/2018

Day: Thursday

Maximum Marks: 60

Time: 09:45 am - 12:15 pm

Instructions:

1. **Part A is compulsory.**
2. **Attempt any four from part B.**
3. **Use of nonprogrammable calculator is permissible.**
4. **Figures to right indicate full marks.**

Part A

Q. 1 **Solve the following:**

(a) Determine a, b, and c, if $f(z) = x + ay + i(bx + cy)$ is analytic. **2**

(b) Three students A, B and C are in a swimming race. A and B have the same probability of winning and each is twice as likely to win as C. Find the probability that B or C wins. **2**

(c) Find the $Z(e^{-an}sinn\theta)$ **2**

(d) Find $\int_4^{5.2} f(x)\,dx$ by using Trapezoidal rule from the following table **2**

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
f(x)	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

(e) $Evaluate \int_0^{1+i} z^2\,dz\ along\ a\ straight\ line\ y = x$ **3**

(f) Find Fourier sine transform of $f(x) = 2e^{-5x}$ **3**

(g) Find the mean and standard deviation of the following data **3**

x	5	6	7	8	9	10	11
Freq.	2	5	8	10	7	5	3

(h) Using Runge Kutta's second order method, find y at x = 1.2 **3**

$$given: \frac{dy}{dx} = x^2 - y, \quad y(1) = 0.94$$

Part B

Q.2 **(a)** Prove that the function $v = x^2 - y^2 + \frac{x}{x^2+y^2}$ is harmonic, find its harmonic conjugate and the corresponding analytical function $f(z) = u + iv$. **5**

(b) $Evaluate \int_C \frac{(3z^2+2)}{(z-1)(z^2+9)} dz$, *where C is a circle* $|z-2| = 2$ **5**

Q.3 **(a)** Find inverse Z- transform of **5**

$$f(z) = \frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$$

(b) Find Fourier cosine transform of **5**

$f(x) = e^{-x}cosx, \ 0 \leq x \leq \infty$

Q.4 **(a)** In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5%, 4%, and 2 % are defective bolts respectively. A bolt is drawn at random from the product and is found to be defective. What is the probability that it is manufactured by machine B? **5**

(b) Find the lines of regression from the following data **5**

X	1	2	3	4	5	6	7	8	9
Y	9	8	10	12	11	13	14	16	15

Q.5 **(a)** Using Newton's interpolation formulae find the value of y at x = 4.2 and x = 19.5 from the following data. **5**

x	3	6	9	12	15	18	21
y	176	185	194	203	212	220	229

(b) Using Runge Kutta's fourth order method, find y at x = 0.2 **5**

$Given: \frac{dy}{dx} = 3x^2 + y^2, \quad y(0) = 1$

Q.6 **(a)** Find a bilinear transformation which maps points $1, -i, -1$ of z-plane to $i, 0, -i$ of w-plane. **5**

(b) Using z- transform solve the difference equation **5**

$y_{n+2} - 6y_{n+1} + 9y_n = 3^n, \quad y_0 = 0, \ y_1 = 1$

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Institute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070121) BACHELOR OF TECHNOLOGY
Computer Science and Engineering, Information Technology

Batch: 2015-19,2016-20

Semester: IV

Course: Applied Mathematics

Course Code: 0701220401CS, 0701240401IT

Date: 10/05/2018 **Maximum Marks:** 60

Day: Thursday **Time:** 09:45 am - 12:15 pm

Instructions:

1. **All questions are compulsory.**
2. **Use of non programmable calculator is allowed.**

Q.1. **a)** Evaluate $\int_0^{1+i}(x^2 - iy)dz$ along the parabola $y = x^2$ **3**

b) Find the bilinear transformation which maps the points $(0, 1, \infty)$ in Z plane onto the points $(-1, -2, -i)$ in the W plane. **3**

c) Find the analytic function whose imaginary part is $e^x \sin y$ **3**

d) Find the poles of $\frac{z^2}{(z+1)^2(z+2)}$ and residues at each pole. Hence evaluate $\int_C \frac{z^2}{(z+1)^2(z+2)}$ where C is the circle with center at -1 and radius 2. **4**

Q.2 **a)** Solve the integral equation $\int_0^\infty f(\theta)\cos\alpha\theta\, d\theta = \begin{cases} 1-\alpha & 0 \le \alpha < 1 \\ 0 & \alpha > 1 \end{cases}$ **3**

b) Find the Fourier transform of $f(x) = \begin{cases} x & 0 < x < 1 \\ 2-x & 1 < x < 2 \\ 0 & x > 2 \end{cases}$ **4**

c) Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$, given $y_0 = y_1 = 0$ **4**

Q.3 **a)** Find the positive root of $x^2 + 2x - 2 = 0$ correct to three significant figures using Newton – Raphson method. **3**

b) Use Runge Kutta method of fourth order to obtain $y(0.1)$: given that $\frac{dy}{dx} = x^2 - y$ with initial condition $y(0) = 1$ **4**

c) The deflection d measured at various distances x from one end of a cantilever are given as follows. Find d when $x = 0.95$ **4**

x	0	0.2	0.4	0.6	0.8	1
d	0	0.035	0.117	0.2165	0.2995	0.334

Q.4 a) In a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively. Calculate the mean of x and y and also the coefficient of correlation between x and y. **3**

b) The ranks of the same 15 students in two subjects A and B are given below: the two numbers within the brackets denoting the ranks of the same student in A and B respectively. (1, 10), (2, 7), (3, 2), (4, 6), (5, 4), (6, 8), (7, 3), (8, 1), (9, 11), (10, 15), (11, 9), (12, 5), (13, 14), (14, 12), (15, 13). Find the rank correlation coefficient. **3**

c) The prices of two articles A and B for six consecutive weeks are given below. Find which has a more variable price? **5**

A	314	326	336	368	404	412
B	330	331	320	318	321	330

Q.5 a) A certain screw making machine produces an average of 2 defective screws out of 100 and pack them in boxes of 500. Find the probability that a box contains 15 defective screws. **3**

b) A consulting firm rents cars from three agencies A_1, A_2 and A_3, 20 % of the cars are rented from A_1, 20 % from A_2 and remaining 60 % from A_3. If 20 % of the cars rented from A_1, 10 % of the cars rented from A_2 and 2 % of the cars rented from A_3 have bad tyres. What is the probability that a car rented from consulting firm will have bad tyres? **3**

c) In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for a) more than 2150 hours b) less than 1950 hours. Given that $A(z = 1.5) = 0.4332, A(z = 1.83) = 0.4664, A(z = 2) = 0.4772$ **3**

Q. 6 A homogeneous rod of conducting material of length 100 cm with insulated sides has its ends kept at non zero temperature and the temperature initially is $u(x, 0) = \begin{cases} x & 0 \le x \le 50 \\ 100 - x & 50 \le x \le 100 \end{cases}$. Find the temperature u(x, t) at any time t. **5**

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nstitute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070121) BACHELOR OF TECHNOLOGY
Computer Science and Engineering

Batch: 2012-16,2013-17,2014-18,2015-19,2016-20

Semester: IV

Course: Software Engineering

Course Code: 0701220404CS

ate: 15/05/2018 **Maximum Marks: 60**

ay: Tuesday **Time: 09:45 am - 12:15 pm**

Instructions:

1. **Draw neat labeled diagrams wherever necessary.**
2. **All questions are compulsory.**

Q.1	a)	Explain the need to learn software engineering concepts. Name four SDLC models.	4
	b)	Elaborate V-model with a labeled diagram.	4
	c)	Describe "throwaway" model with the help of an example.	4
Q.2	a)	Illustrate McCall's quality factors.	6
	b)	Define risk in context of software development process. Mention the different categories of risk. Elaborate RMMM plan.	6

Q.3 **a)** Draw a neat and labeled DFD of the given situation. (Draw all levels that you think are necessary to explain the entire scenario.) **8**

A company needs to develop a time management system for its executives. The software should let the executives register their daily appointment schedules. The information to be stored includes persons(s) with whom meeting is arranged, venue, the time and duration of the meeting, and the purpose (eg. For a specific project work). When a meeting involving many executives needs to be organized, the system should automatically find a common slot in the diaries of the concerned executives, and arrange a meeting(i.e. make relevant entries in the diaries of all the concerned executives) at that time. It should also inform the concerned executives about the scheduled meeting through e-mail. If no common slot is available, TMS should help the secretary to rearrange the appointments of the executives in consultation with the concerned executives for making room for a common slot. To help the executives check their schedules for a particular day the system should have a very easy-to-use graphical interface. Since the executives and the secretaries have their own desktop computers, the time management software should be able to serve several remote requests simultaneously. Many of the executives are relative novices in computer usage. Every day morning the time management software should e-mail every executive his appointments for the day. Besides registering their appointments and meetings, the executives might mark periods for which they plan to be on leave.

b) Discuss how can one gather requirements in the software development process? Explain how functional requirements differ from non-functional requirements. **4**

Q.4 **a)** Give main idea of a design pattern template. **5**

b) Elaborate data-flow architectural style with a labeled diagram. **5**

c) Elaborate the concept of control hierarchy. **2**

Q.5 **a)** Give four distinct test cases for a washing machine. **4**

b) Demonstrate drivers and stubs with respect to unit testing. **4**

c) Define functional testing. List the characteristics of functional testing. **4**

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Programme: (070121) BACHELOR OF TECHNOLOGY
Computer Science and Engineering

Batch: 2014-18,2015-19,2016-20

Semester: IV

Course: Java & Web Technologies

Course Code: 0701220403CS

Date: 19/05/2018

Day: Saturday

Maximum Marks: 60

Time: 09:45 am - 12:15 pm

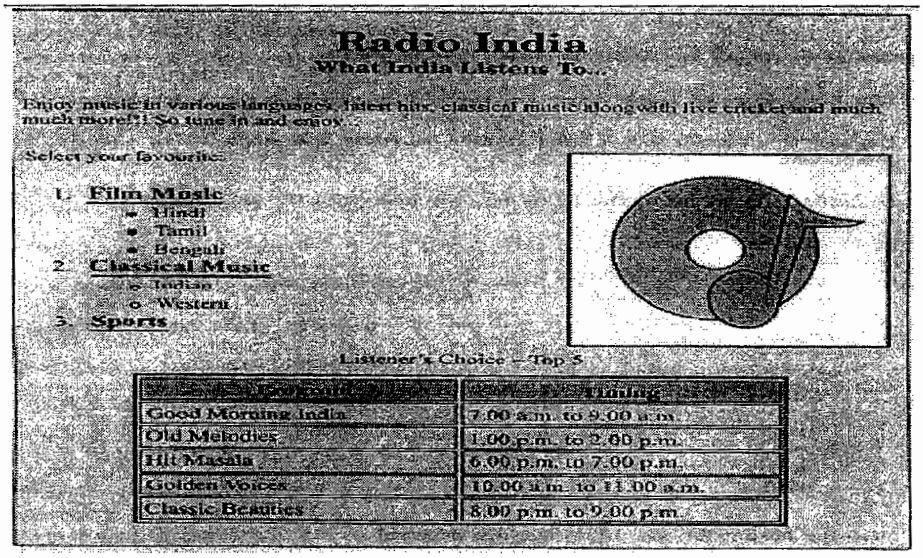
Instructions:

1. **All questions are compulsory.**

Q.1	**a)**	What is JVM and why is java called a platform independent programming language. Why is C++ not platform independent?	7
	b)	What is difference between Array and ArrayList? When will you use Array over ArrayList? Explain with an example.	4
	c)	Explain the "static" keyword in java. Can you override private or static methods in java?	4
Q.2	**a)**	Justify the statement "A base class reference variable can refer to a derived class object". Also write a program for the following : You are given an interface *AdvancedArithmetic* which contains a method signature int *fibSum(int n)*. You need to write a class called MyCalculator which implements the above interface. The *fibSum()* function just takes an integer as input and return the sum of all intermediate Fibonacci numbers. For example if the number 8, the function will return sum of 0+1+ 1+ 2+ 3+ 5, so *fibSum* should return 12. You need to write the interface, class MyCalculator and Demo class.	7
	b)	Explain the various exception handling keywords in java using suitable examples.	8
Q.3		What are HTML tags? Write a HTML code to generate a Web Page in the format given below. Consider the following while writing the HTML code :	8

i) Title of the page is "Radio India".
ii) Background color of page should be "Yellow", text color should be blue &visited link color should be "Green".
iii) Text color of main heading on the page should be "Maroon".
iv) Font face of text in the page should be "Arial".
v) Picture used in the page is the file "music.jpg".
vi) Use the concept of nested list to display the given list.
vii) Pages linked to :
Film Music as "film.html"
Classical Music as "class.html"
Sports as "sports.html"

The table should have a caption "Listener's Choice - Top 5", a border of 2 pixels and the background color of the first row should be "Aqua".



Q.4 Explain in detail the life cycle of a java Applet with diagram. **7**

Q.5 **a)** Summarize the basic principle of RMI architecture in java. Describe in detail the purpose and use of Socket and ServerSocket classes in java. **5**

b) Compare and contrast multiprocessing and multi-threading. **2**

Q.6 A rational number is a number in the form of $\frac{a}{b}$ where 'a' and 'b' are integers and $b \neq 0$. Rational numbers can be added and divided. Write a Java application that will be able to add, divide two rational numbers. Also include functions to reduce rational numbers and find absolute value for rational numbers. **8**

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rogramme: (070121) BACHELOR OF TECHNOLOGY
Computer Science and Engineering, Information Technology

atch: 2012-16,2013-17

emester: IV

ourse: Java & Web Technologies

ourse Code: 0701210403CS, 0701210403IT

ate: 19/05/2018

ay: Saturday

Maximum Marks: 75

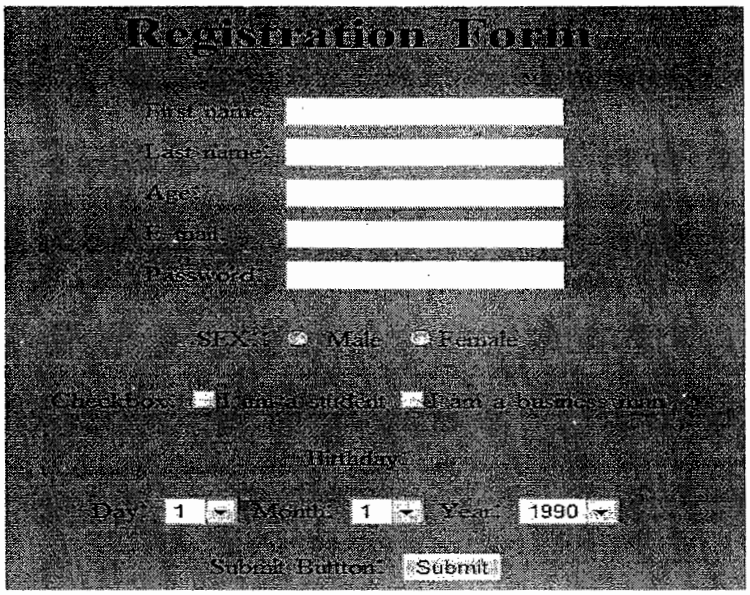
Time: 09:45 am - 12:15 pm

Instructions:

1. **All the questions are compulsory.**

Q.1	**a)**	Discuss in details the following features of java: Abstraction, Encapsulation, Polymorphism and Inheritance.	**10**
	b)	Which of the following is generated when the source code is successfully compiled? Explain your answer..exe file i) .class file ii) .java file iii) .jar file iv) None of above Also discuss the concept of Byte code in java.	**5**
	c)	What is autoboxing and unboxing in java?	**5**
Q.2	**a)**	Discuss the exception handling mechanism in java.	**8**
	b)	Compare and contrast interface and an abstract class in java.	**7**
	c)	Explain the usage of Java packages. Write a short note on access specifiers and access protection using java packages.	**5**
Q3.		What are methods that control an applet's life cycle? Also show with the help of a life-cycle diagram. Create a java applet program to place a circle at random on our applet. Have four buttons on the applet "grow", "shrink", "move left ", "move right" to perform corresponding action on the circle when button is pressed.	**10**

Q4. What is HTML and HTML tags? Write a HTML code to generate a Web page given below: **10**



Q.5 Explain the basic principle of RMI architecture. Discuss the steps involved to design a RMI program in java. **10**

Q.6 Discuss java threads. What is the difference between processes and threads? **5**

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Institute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070121) BACHELOR OF TECHNOLOGY
Computer Science and Engineering

Batch: 2012-16,2013-17,2014-18,2015-19,2016-20

Semester: IV

Course: Data Structures

Course Code: 0701220405CS

Date: 17/05/2018

Day: Thursday

Maximum Marks: 45

Time: 09:45 am - 11:15 am

Instructions:

1. **All questions are compulsory.**
2. **Neat diagrams must be drawn wherever necessary.**

Q.1 **a)** Write function to implement ' DLL's delete from end'. **4**

b) Write function to implement the following operations on a single linked list for inserting the node at: **6**

i) Beginning
ii) An intermediate position
iii) End

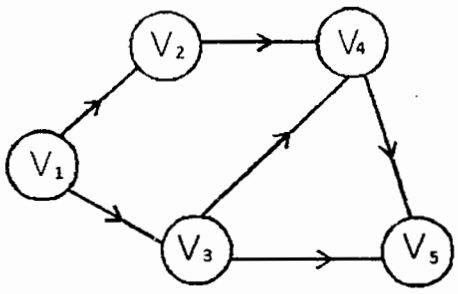
Q.2 **a)** Illustrate the concept of a threaded binary tree. Write an algorithm to perform in-order traversal of threaded binary tree. **4**

b) Write an algorithm to implement the BST deletion operation for following three cases: **6**

i) Delete leaf node
ii) Delete node with a single child
iii) Delete node with both children

Q.3 **a)** Illustrate applications of graph. **4**

b) Write and apply the topological sort algorithm on following graph. **6**



Q.4		Perform height balancing for the following data to construct AVL tree. MAR, MAY, NOV, AUG, APR, JAN, DEC, JUL, FEB, JUN, OCT, SEP.	**5**
Q.5	**a)**	Write advantages & disadvantages of sequential access file organization.	**4**
	b)	Illustrate collision resolution strategies. Explain any one open addressing mechanism in detail.	**6**

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