



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

Semester: IV

Course: Data Structures

Course Code: 0701220405CS

ESG

CS - October - 2018

Date: 13/11/2018

Maximum Marks: 45

Day: Tuesday

Time: 09:45 am - 11:15 am

Sem - IV

Instructions:

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

Q.1 a) Apply Generalized linked list concept to represent following polynomial: 4

$$P(x,y,z) = x^{10} y^3 z^2 + 2x^8 y^3 z^2 + 3x^8 y^2 z^2 + x^4 y^4 z + 6 x^3 y^4 z + 2 yz$$

b) Write function for the stack data structure using the linked list concept. 6

Q.2 a) Illustrate the concept of threaded binary tree. Write an algorithm for pre-order traversal of threaded binary tree. 4

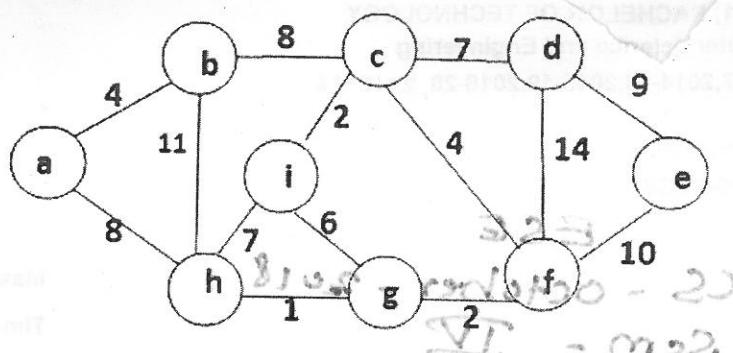
b) Write an algorithm to implement the BST deletion operation for following three cases:

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

Q.3 a) Construct graph from the adjacency matrix of a directed graph G given below 4

0	1	1	1
0	0	0	1
0	0	0	0
0	0	0	0

- Q.3 b)** Write Prim's algorithm and apply it to following graph to get the shortest distance path, assuming starting vertex a:



- Q.4** Produce the AVL tree for the following values: 15, 20, 24, 10, 13, 7, 30, 36, 25. 5

- Q.5 a)** Write advantages & disadvantages of the direct access file organization. 4
- b)** Illustrate collision resolution strategies. Explain chaining mechanism using a linked list in detail. 6

Q.3 c) Consider the snapshot of the following system:

4

Process	Max			Allocated			Available		
	A	B	C	A	B	C	A	B	C
P0	7	5	3	0	1	0	3	3	2
P1	3	2	2	2	0	0			
P2	9	0	2	3	0	2			
P3	2	2	2	2	1	1			
P4	4	3	3	0	0	2			

Predict the outcome of the following questions using Bankers algorithm

- Is the system in a safe state?
- If a request from process P4 for (3, 3, 0) arrives, can it be granted?

Q.4 a) Explain Paging vs Segmentation. Consider a paging system with the page table stored in memory. If a memory reference takes 200 nanoseconds, how long does a paged memory reference take? If we add associative registers (TLB), and 75 percent of all page table references are found in associative registers, what is the effective memory reference time? Assume that finding a page-table entry in the TLB takes zero time.

4

b) Summarize the action taken by the operating system when the page fault occurs.

4

Q.5 Explain following concepts w.r.t. file systems

4

- File mounting
- File access methods

Q.6 Describe the following disk scheduling algorithms: FCFS, SSTF, and SCAN.

5

(e) Consider the sequence of the following steps

Step 1		Step 2		Step 3		Step 4		Step 5		Step 6	
1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12
2	3	4	5	6	7	8	9	10	11	12	1
3	4	5	6	7	8	9	10	11	12	1	2
4	5	6	7	8	9	10	11	12	1	2	3
5	6	7	8	9	10	11	12	1	2	3	4
6	7	8	9	10	11	12	1	2	3	4	5
7	8	9	10	11	12	1	2	3	4	5	6
8	9	10	11	12	1	2	3	4	5	6	7
9	10	11	12	1	2	3	4	5	6	7	8
10	11	12	1	2	3	4	5	6	7	8	9
11	12	1	2	3	4	5	6	7	8	9	10
12	1	2	3	4	5	6	7	8	9	10	11

What is the value of $S = \sum_{i=1}^{12} a_i$ after the 12th step? (Give your answer in base 12)

- 1) 10000000000000000
2) 1000000000000000
3) 100000000000000
4) 10000000000000
5) 1000000000000
6) 100000000000
7) 10000000000
8) 1000000000
9) 100000000
10) 10000000
11) 1000000
12) 100000
13) 10000
14) 1000
15) 100
16) 10
17) 1
18) 0



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, Information Technology

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

Semester: IV

Course: Engineering Mathematics III

Course Code: 0701210401CS, 0701210401IT

Date: 17/11/2018

Maximum Marks: 60

Day: Saturday

Time: 09:45 am - 12:15 pm

Instructions:

- Part A is compulsory.
- Attempt any four from part B.
- Use of nonprogrammable calculator is permissible.
- Figures to right indicate full marks.

Part A

Q. 1 Solve the following:

- (a) Show that the function $v = e^{-x}(x \cos y + y \sin y)$ is harmonic. 2
- (b) Evaluate $\int_C \frac{1}{z} dz$, where c is a circle $|z| = r$ 2
- (c) A can hit the target 4 times in 5 shots; B can hit the target 3 times in 4 shots and C can hit the target twice in 3 shots. They started hitting together, what is the probability that two of them hit the target? 2
- (d) If the lines of regression are $7x - 16y + 9 = 0$ and $4x - 5y + 3 = 0$ then find the coefficient of correlation and means \bar{x}, \bar{y} . 2
- (e) Find Z-transform of $\frac{1}{2}(n+1)(n+2)$ 3
- (f) Find Fourier transform of $f(x) = x^2 + 5$, $0 \leq x \leq 1$ 3
- (g) Use Euler's Method, find y at $x = 0.3$ 3

Given $\frac{dy}{dx} + 2y - x^2 = 0$, $y(0) = 1$ and $h = 0.1$

- (h) The following table gives velocity v of a particle at time t. Using Simpson's 1/3rd rule find the distance covered by the particle in 12 seconds. 3

t (sec)	0	2	4	6	8	10	12
v (m/sec)	4	6	16	34	60	94	136

Part B

- Q.2 (a)** Find the bilinear transformation which maps points $0, \frac{1}{2}, 1+i$ from Z-plane onto $-4, \infty, \frac{13-12i}{5}$ of W-plane. 5

- (b)** Using Cauchy's residue theorem evaluate 5

$$\int_C \frac{dz}{(z^2 + 1)(z^2 - 4)}, \text{ where } c \text{ is a circle } |z| = 1.5$$

- Q.3 (a)** Find inverse Z - transform of $U(z) = \frac{3z^2 - 18z + 26}{(z-2)(z-3)(z-4)}$ 5

- (b)** Using Fourier Integral representation , show that 5

$$\int \frac{\cos\left(\frac{\pi\lambda}{2}\right) \cos\lambda x}{1 - \lambda^2} d\lambda = \begin{cases} \frac{\pi}{2} \cos x, & |x| \leq \frac{\pi}{2} \\ 0, & |x| > \frac{\pi}{2} \end{cases}$$

- Q.4 (a)** Find the coefficient of correlation between the rainfall and discharge in a certain river from the following data 5

Rainfall (cm)	3.9	4.6	6.8	7.7	8.9	9.5
Discharge (cc)	33.5	36.3	40.0	45.8	53.5	61.2

- (b)** The income of a group of 10000 persons is normally distributed with mean Rs. 750 per day with standard deviation of Rs. 50. Find the number of persons whose income (i) exceeds Rs. 668 (ii) lies between Rs. 668 and Rs. 832. (Given $A(z = 1.64) = 0.4495$). 5

- Q.5 (a)** The following table gives population of a town during the last six censuses. Estimate the population during the period 1946 to 1978. 5

year	1941	1951	1961	1971	1981	1991
Population (in thousand)	12	15	20	27	39	52

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

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

- Q.6 (a)** Find the analytic function $f(z) = u + iv$ if, $u + v = 3(x + y) + \frac{x-y}{x^2+y^2}$ 5

- (b)** Fit a Poisson's distribution to the following data 5

x	0	1	2	3	4
f	46	38	22	9	1



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, Information Technology
Batch: 2013-17, 2012-16
Semester: IV
Course: Java & Web Technologies
Course Code: 0701210403CS, 0701210403IT

Date: 16/11/2018

Maximum Marks: 75

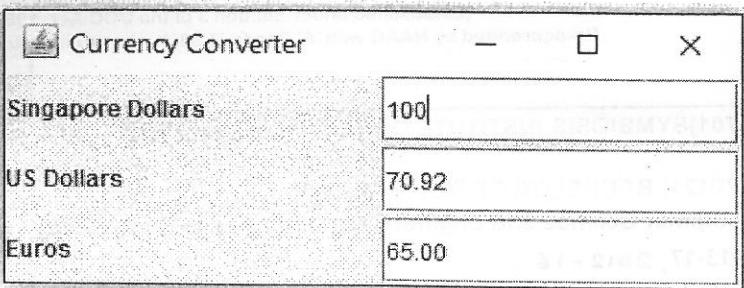
Day: Friday

Time: 09:45 am - 12:15 pm

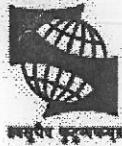
Instructions:

1. All the questions are compulsory.

- Q.1 a) Discuss following input methods in Java with the help of example. 8
- i) Command line arguments
 - ii) Scanner
 - iii) Console
 - iv) BufferedReader
- b) Translate the following problem statement into java program 7
- i) Write a class named Worker.
 - ii) Derive the classes Daily_Worker and Salaried_Worker from it.
 - iii) Every worker has a name and a salary rate. Write method ComPay (int hours) to compute the week pay of every worker.
 - iv) A Daily Worker is paid on the basis of number of days he/she work.
 - v) The Salaried Worker gets paid the wage for 40 hours a week no matter what actual hours is.
 - vi) Test this program to calculate the pay of workers.
- c) What is inheritance? How will you call parameterized constructor and overridden method from parent class in sub class? 5
- Q.2 a) Explain the interface in detail. State the advantages of using interface. Differentiate it from abstract class. 6
- b) Write a simple currency converter, as shown in the figure. User can enter the amount of "Singapore Dollars", "US Dollars", or "Euros", in floating-point number. The converted values shall be displayed to 2 decimal places. Assume that 1 USD = 1.31 SGD, 1 USD = 0.80 Euro, 1 SGD = 0.65 Euro. 8



- c) Explain in brief the exception-handling mechanism in java with an example. 8
- Q.3 Describe a Web page. Discuss how to create different types of lists using HTML tags with the help of suitable examples. 10
- Q.4 a) Demonstrate life cycle of Applet with the help of diagram. 5
b) Implement a java program using prepared statement to add record in student table containing roll number and name. 5
- Q.5 What are the different ways to create a thread in java? Explain with example. 5
- Q.6 Explain in detail the RMI architecture with a neat diagram. 8



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.

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: Java & Web Technologies

Course Code: 0701220403CS

Date: 16/11/2018

Maximum Marks: 60

Day: Friday

Time: 09:45 am - 12:15 pm

Instructions:

1. All questions are compulsory.

Q.1 a) Differentiate between the concept of overloading and overriding in java. Justify the statement "Constructors cannot be overridden" with a suitable example. 7

b) The expected signature of the main method is *public static void main ()*. Explain the significance of each of these keywords. What happens if we forget to put the static keyword? (Justify your answer)
i) The JVM issues an Error at runtime saying that main method should be declared static
ii) The compiler issues a warning saying that main method should be declared static and adds it automatically
iii) The JVM successfully invokes the main method

c) Describe the following methods with proper syntax and suitable examples for accepting a numeric user input in a java program: Scanner and Console class. 4

Q.2 a) Explain the usage of java packages as a naming and visibility control mechanism in java. Assume you have written some classes. Later, you decide they should be split into three packages, as listed in the following table. Furthermore, assume the classes are currently in the default package (they have no package statements). 7

Destination Packages

Package Name	Class Name
mygame.server	Server
mygame.shared	Utilities
mygame.client	Client

- i) Which line of code will you need to add to each source file to put each class in the right package?

- ii) To adhere to the directory structure, you will need to create some subdirectories in the development directory and put source files in the correct subdirectories. What subdirectories must you create? Which subdirectory does each source file go in?
- iii) Do you think you'll need to make any other changes to the source files to make them compile correctly? If so, what?
- b) How does java simulate and support multiple inheritance through the use of interfaces. Explain in details with examples. What is wrong with the following interface?

```
public interface SomethingIsWrong { }
```

```
void aMethod(int aValue){}
```

```
System.out.println("Hello Java");
```

Suggest the correct change also to fix the interface.

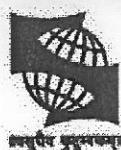
- Q.3** What is the difference between HTML elements and tags? Write a HTML code to generate a Web Page shown below using forms and basic HTML tags. 8

Pizza Shop 2.0	
Name	
Pizza Topping	<input type="radio"/> Supreme <input type="radio"/> Vegetarian <input type="radio"/> Hawaiian
Pizza Sauce	Tomato <select style="width: 100px; border: 1px solid black; border-radius: 5px; padding: 2px; margin-left: 10px;"> </select>
Optional Extras	<input type="checkbox"/> Extra Cheese <input type="checkbox"/> Gluten Free Base
Delivery Instructions:	
<input type="button" value="Send my Order"/>	

- Q.4** Summarize the difference between an applet and a java application? What are the security restrictions imposed on java applets? 7

- Q.5** a) Explain the java RMI architecture with a neat diagram. 5
b) Discuss the concept of threads. List the different ways to create a thread in java. 2

- Q.6** Write classes Circle and Box that extend an abstract class "Figure". Circle class has one attribute representing radius of the circle. It has methods returning the perimeter and area of the circle. Circle class has a subclass of a Cylinder class. A Cylinder has a circle as its base and another attribute, its length; it has two methods, calculating and returning its area and volumes. Box class: this class has in total 3 attributes representing the width, height, depth of a box. It has methods returning the volume and the area of the box. This class has a subclass BoxWeight. A BoxWeight has color and weight as its additional attributes. It has methods to calculate volume of Weighted Box and the color of this weighted Box. 8



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

Semester: IV

Course: Software Engineering

Course Code: 0701220404CS

Date: 25/11/2018

Maximum Marks: 60

Day: Sunday

Time: 08:30 am - 11:00 am

Instructions:

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

- Q.1** a) Illustrate the framework activities of software development process. 3
b) How can one select the most suitable SDLC model for a particular software? 2
c) Draw a labeled diagram of the spiral model and describe each of its phases. 7

- Q.2** a) Following are the details of safe home software: 6

External Input: password, panic button, activate/deactivate.

External Output: messages, sensors status.

External inquires: zone inquire, sensor inquiry.

Internal logical files: system configuration file.

External interface files: test sensor, zone setting, alarm alert, monitoring system.

Total degree of influence (total of 14 factors) is 46. The organizational average productivity for systems is 6.5 FP/pm. The cost per FP is approximately \$1230.

Calculate value adjustment factor, FP, estimated project cost and estimated effort.

- b) Assessment of a software system shows that:

4

The system includes

6 screens: 2 simple + 3 medium + 1 difficult. 3 reports: 2 medium + 1 difficult
2 GL components. 30 % of the objects could be supplied from previously developed components. Productivity is high. Compute the estimated effort PM 'Person-months' needed to develop the system using COCOMOII model.

- c) Describe the work breakdown structure of project scheduling.

2

- 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 hotel has a certain number of rooms. Each room can be either single bed or double bed type or maybe AC or non-AC type. The rooms have different rates depending on whether they are of single or double, AC or non-AC types. The room tariff however may vary during different parts of the year depending up on the occupancy rate. For this, the computer should be able to display the average occupancy rate for a given month, so that the manager can revise the room tariff for the next month either upwards or downwards by a certain percentage. Guests can reserve rooms in advance or can reserve rooms on the spot depending on availability of rooms. The receptionist would enter data pertaining to guests such as their arrival time, advance paid, approximate duration of stay and the type of the room required. Depending on this data and subject to the availability of a suitable room, the computer would allot a room number to the guest and assign a unique token number to each guest. If the guest cannot be accommodated, the computer generates an apology message. The hotel catering services manager would input the quantity and type of food items as and when consumed by the guest, the token number of the guest and the corresponding date and time. When a customer prepares to check-out, the hotel automation software should generate the entire bill for the customer and also print the balance amount payable by him.

- b) List four umbrella activities of software development process.

4

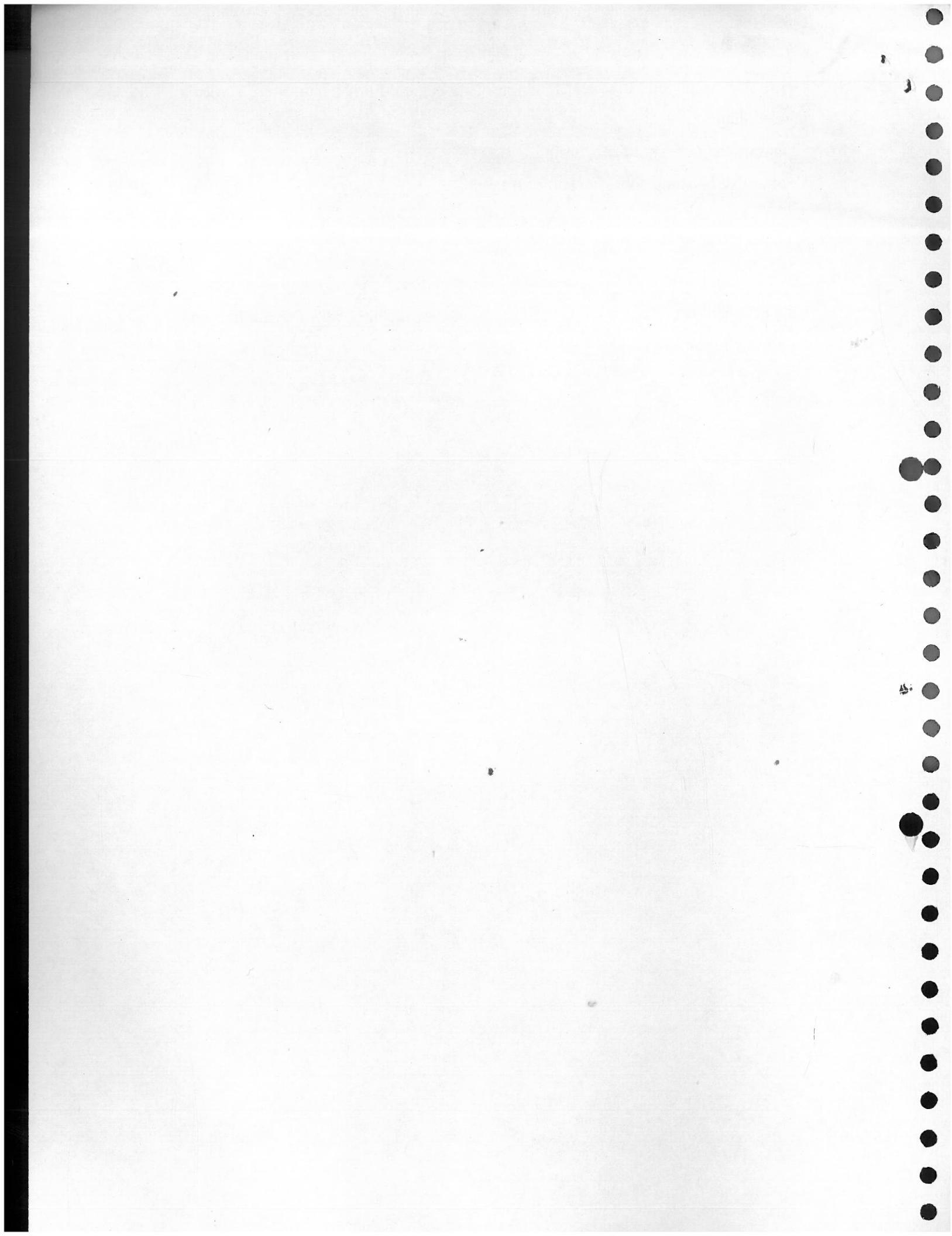
Q.4 a) Name five architectural styles. Elaborate data-centered architectural style with a labeled diagram. 8

b) Elaborate the concept of refactoring. 2

c) Distinguish between cohesion and coupling. 2

Q.5 a) Write four distinct test cases for a calculator. 4

b) Describe integration testing. Name the three different types of integration testing. Explain top down integration technique in detail with the help of a diagram and mention its pros and cons.





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, Information Technology

Batch: 2015-19,2016-20

Semester: IV

Course: Applied Mathematics

Course Code: 0701220401CS, 0701240401IT

Date: 17/11/2018

Maximum Marks: 60

Day: Saturday

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 $\oint_C \frac{z^2 - 1}{z^2 + 1} dz$ where C : $|z - i| = 1$ 3

b) Evaluate $\int_C (z - z^2) dz$, where C is the upper half of the circle $|z| = 1$ 3

c) Find the bilinear transformation which maps points $1, i, -1$ from Z-plane to $0, 1, \infty$ of W-plane. 3

d) Find the most general analytic function whose real part is $u = \frac{x}{x^2+y^2}$ 4

Q.2 a) Solve the integral equation $\int_0^\infty f(\theta) \sin \lambda \theta d\theta = e^{-\lambda}, \lambda > 0$ 3

b) Find the Fourier integral representation of $f(x) = \begin{cases} 1 & \text{if } |x| < 1 \\ 0 & \text{if } |x| > 1 \end{cases}$ and deduce 4
the value of $\int_0^\infty \frac{\sin \lambda d\lambda}{\lambda}$

c) Solve the difference equation $y_{n+1} + 3y_n = u(n) + n$ with $y_0 = 1$ 4

Q.3 a) Use trapezoidal rule to evaluate $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{1 - \frac{1}{2} \sin^2 \theta}}$ by dividing the interval into 5 3
equal parts.

b) Given that $f(3) = 8, f(2) = 26, f(1) = 32, f(-1) = -40, f(0) = 14$, find 4
 $f(x)$ as a polynomial in x and hence find the value of $f(2.5)$

- c) Find a real root of $x \log_{10} x = 2$ correct to 4 decimal places by using Regula Falsi method. 4

Q.4 a) The expenditure of 1000 families is given as under. 3

Exp(Rs)	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139
No. of families	50	a	500	b	50

The median for the distribution is Rs. 87. Calculate the missing frequencies.

- b) Various doses of poisonous substances were given to groups of 25 mice and the following results were observed. 4

Dose (mg)	4	6	8	10	12	14	16
No. of deaths	1	3	6	8	15	17	20

Find regression line of number of deaths on dose and hence estimate the number of deaths in a group of 25 mice who receive a dose of 7 mg of this poison.

- c) Calculate the mean and standard deviation from the following data. 4

C.I	90-100	80-90	70-80	60-70	50-60	40-50	30-40
f	2	12	22	20	11	4	1

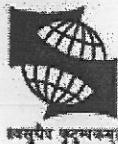
- Q.5** a) There are three bags: first containing 1 white, 2 red, 3 green balls, second containing 2 white, 1 red and 2 green balls. Two balls are drawn from a bag chosen at random. These are found to be one white and one red. Find the probability that the balls so drawn came from second bag. 3

- b) In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10, use P-distribution to calculate the approximate number of packets containing no defective, one defective and two defective blades respectively in a consignment of 10000 packets. 3

- c) Fit a binomial distribution for the frequency distribution. 3

x	0	1	2	3	4	5
f(x)	2	14	20	34	22	8

- Q.6** A condenser of capacity C discharged through an inductance L and resistance R in series and charge q at time t satisfies $L \frac{d^2 q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = 0$. Given that $L = 0.25$ henries, $R = 250$ ohms, $C = 2 \times 10^{-6}$ farads and that when $t = 0, q = 0.002$ coulombs and $I = 0$. Obtain the value of q in terms of t . Assume that $\frac{R}{L}$ is small. 5



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, Information Technology

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

Semester: IV

Course: Microprocessor Techniques

Course Code: 0701220406CS, 0701240406IT

Date: 01/12/2018

Maximum Marks: 45

Day: Saturday

Time: 01:30 pm - 03:00 pm

Instructions:

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

- Q.1** a) What is the functionality of Execution unit in the architecture of 8086? Draw correctly labeled diagram of the architecture of 8086. 5
b) When does 8086 work in maximum mode? Draw and explain maximum based system of 8086. 10

- Q. 2** Given below is the snippet of the assembly language program : 10
Call disp cont...

mov si, arr1+2	proc disp near
mov di, arr2+2	lea si, str
cld	mov al,09h
repe cmps	int 21h
je down	ret
cont...	endm

List down any 4 errors in the program snippet which an assembler would find and explain instruction/assembler directive – CMPS and PROC.

SYLLABUS OF COMPUTER ENGINEERING

- Q.3** Design command words for 8259 based system for following specifications : **10**
Total number of interrupts are 48, Interrupt type 40, Level triggered ,
cascaded mode, ICW4 needed, end of interrupt, buffered slave mode.
Draw complete interfacing diagram of 8086 and 8259.
- Q.4** Interface 8X8 matrix keyboard to 8086 with 8255 and design the command word. **5**
- Q.5** List features of 8087 and explain FRNDINT instruction. **5**
