

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Mid-Semester Examination
Course No.: Phy 4241
Course Title: Physics II

Summer Semester, A. Y. 2017-2018
Time: 90 Minutes
Full Marks: 75

There are 4 (four) questions. Answer any 3 (three) questions. All questions carry equal marks. Marks in the margin indicate full marks. Programmable calculators are not allowed. Do not write on this question paper. All symbols bear their usual meanings.

1. a) For the circuit shown in Fig. 1(a), find V_0 / V_s in terms of α , R_1 , R_2 , R_3 , and R_4 . 08
If $R_1 = R_2 = R_3 = R_4$, what value of α will produce $|V_0 / V_s| = 15$?

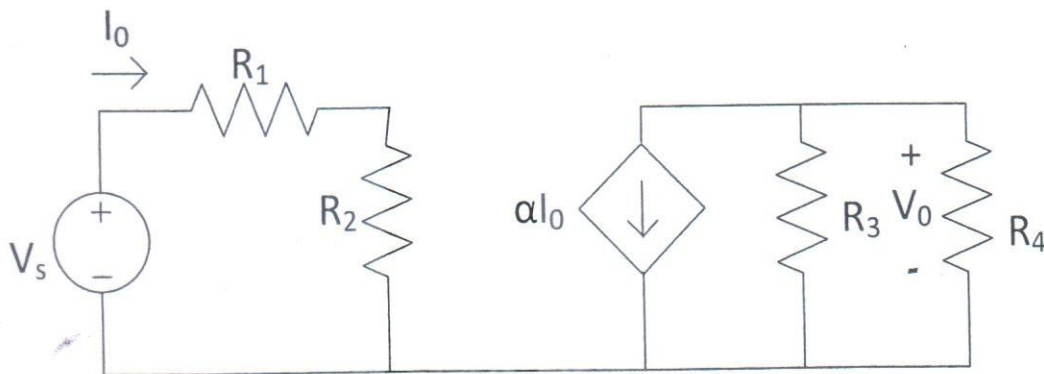


Fig. 1(a)

- b) Obtain the equivalent resistance, R_{ab} in the circuit of Fig. 1(b). All the resistors have a value of 40Ω . 13

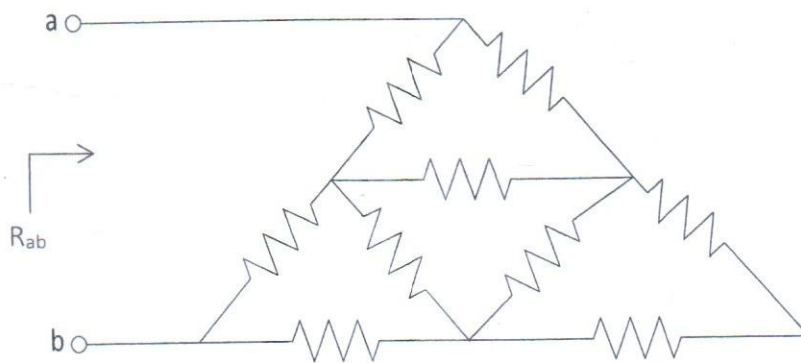


Fig. 1(b)

- c) Define supermesh and supernode.

2. a) Find the node voltages of the circuit shown in Fig. 2(a).

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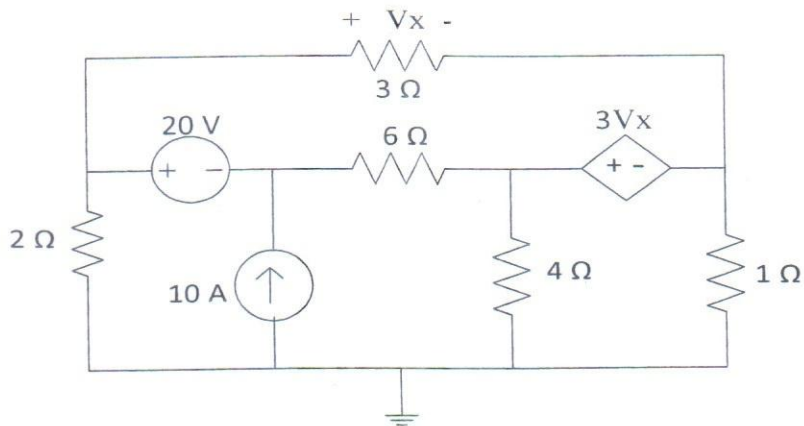


Fig. 2(a)

b) Write one use of Δ -Y transformation. Find the current delivered by the source in the circuit shown in Fig. 2(b).

10

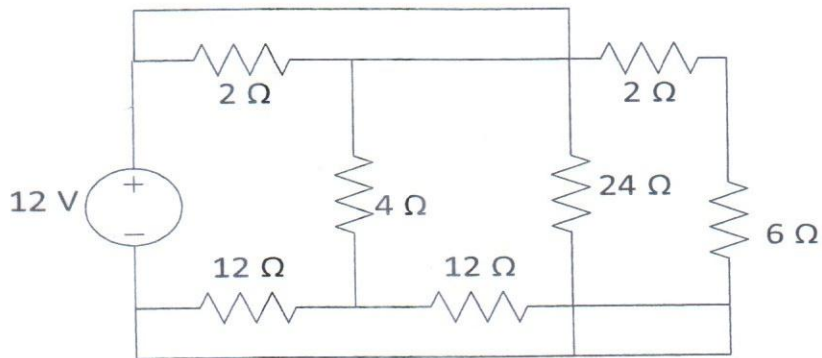


Fig. 2(b)

3. a) Use both resistance and source combinations, as well as, current division, in the circuit of Fig. 3(a) to find the power absorbed by the 1 Ω resistor.

15

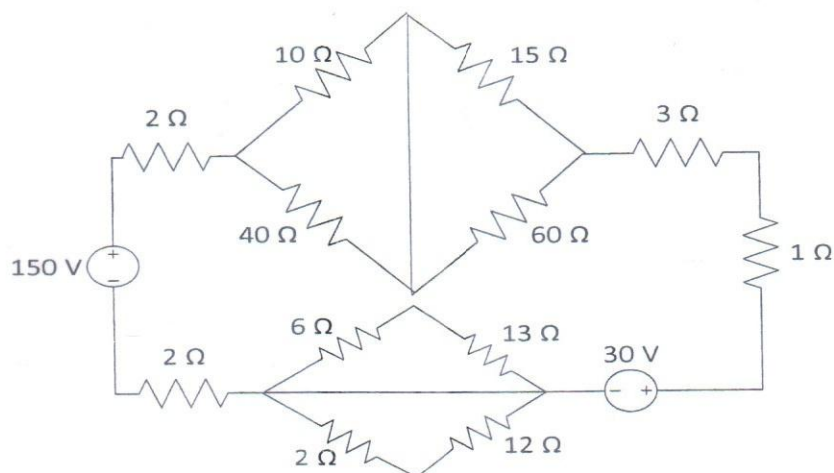


Fig. 3(a)

- b) Find the values of R_1 and R_2 in the circuit of Fig. 3(b) if the voltmeter and ammeter read 6 V and 0.6 A, respectively. 10

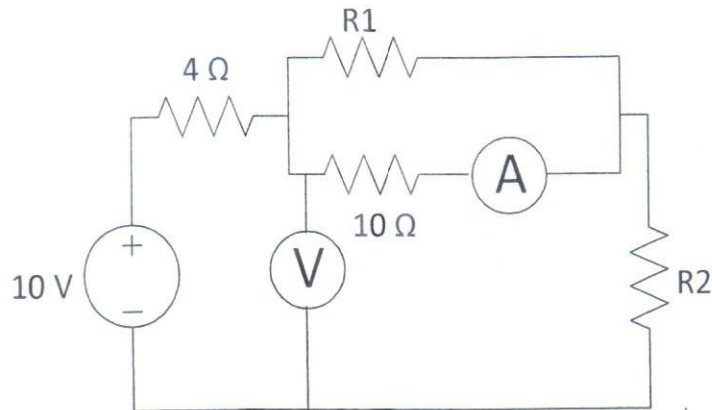


Fig. 3(b)

4. a) In the circuit shown in Fig. 4(a), find the terminal voltage, V_{ab} using superposition theorem. 12

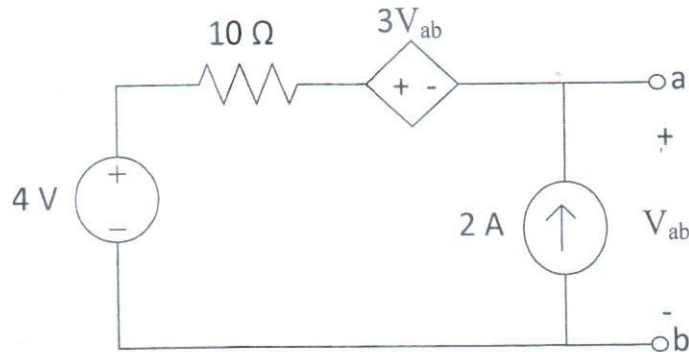


Fig. 4(a)

- b) The variable resistor in the circuit shown in Fig. 4(b) is adjusted for maximum power transfer to R_L . Find the value of R_L . Also find the maximum power that can be delivered to R_L . 13

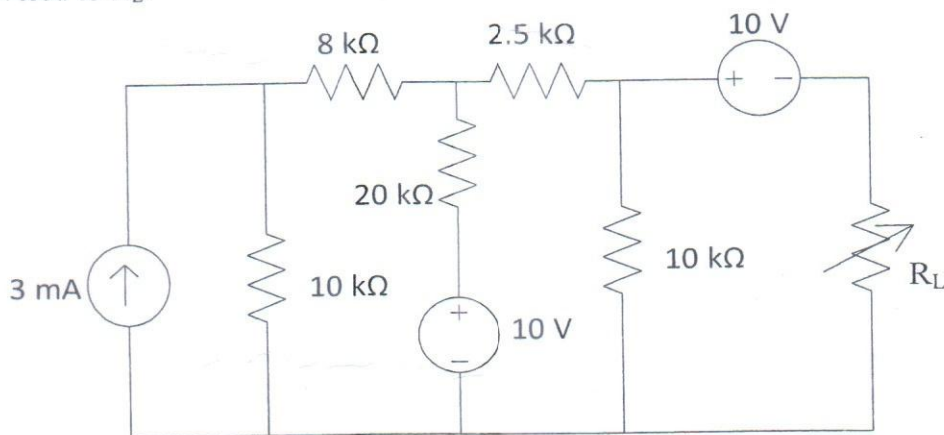


Fig. 4(b)

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

Chem 4241: Chemistry

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

-
1. a) Derive the integrated rate equation for a second order reaction $2A \rightarrow P$ and prove that the half life for a second order reaction. 7+3
 - b) The data of a second order reaction is plotted $1/[A]_t$ against time and the plot is a straight line with a positive slope. If the intercept is $3 \times 10^3 \text{ mol}^{-1} \text{ lit}$ and the slope is $2 \times 10^{-2} \text{ mol}^{-1} \text{ lit. sec}^{-1}$, calculate the initial concentration and half-life of the reaction. 8
 - c) Discuss any two methods for the determination of order of a reaction. 7
 2. a) Define and classify solution. Name the units of concentration and define Molarity (M) and Normality (N) with example. 2+2+5
 - b) What is critical solution temperature (CST)? Draw and explain the CST diagram for the Phenol-water system. What is the application of this diagram? 2+6
 - c) 20gm NaCl is dissolved in 100ml water. Find out the molarity(M) and molality(m) of the solution. The density of the solution = 1.06gm/cc. 8
 3. a) Write Henry's law and show the effect of temperature and pressure on the dissolution of gases in liquid. 8
 - b) Show through mathematical derivation that the solubility of solids in liquids is generally endothermic in nature and that the curve of solubility against temperature is exponential. 8
 - c) Define osmosis, osmotic pressure and reverse osmosis. Mention their uses. State Vant Hoff laws of osmotic pressure and deduce an equation to establish the relationship between molecular weight of a solute and osmotic pressure. 9
 4. a) Define energy of activation (E_a) and show its application through diagram. 6
 - b) The relationship between temperature and the rate constant (k) is exponential. Prove this statement through derivation of an equation. Give application of this equation. 12
 - c) Define vapour pressure above a liquid and also the boiling point of a liquid. What is the characteristic of an ideal solution? State Raoult's law. 7

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MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 50

CSE 4271: Computer Programming

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them including Question No. 4.

Figures in the right margin indicate marks.

1. a) What is typecasting? Why is typecasting required? Explain with proper example. 1+3
 b) Write a program, which takes 10000 integers as input and prints the average of those integers. 5
 c) Write down the output for the following code: 8

```
#include<stdio.h>
int z=5;
int main(void)
{
    int x=998785,y=2;
    printf("%d\n", x*y);
    x=x*y;
    printf("%d\n", ++x);
    printf("%d\n", x++);
    printf("%d\n", --y);
    for( ; y<2;++y) z*=y;
    printf("%d\n", y);
    printf("%d\n", x*y);
    x*=100;
    printf("%d\n", x/y);
    printf("%d\n", z);
    return 0;
}
```

2. a) What are ASCII Values and ASCII Characters? Write a program to print the ASCII values of characters starting from '0' up to '9'. 2+5
 b) Write a program which will take two integers x and y as input where $x < y$ and print the Fibonacci sequence within that range(inclusive of the values): 10

Sample Input	Sample Output
5 7	5
0 8	0 1 1 2 3 5 8
8 14	8 13

3. a) Explain the topics below: 2+2+1
- i. Block of code
 - ii. Local & Global Scope
 - iii. Function Prototype
- b) Here, 1 foot = 30.48 centimeters. Write a program that converts centimeters to foot. Use a function `c_to_f()` to perform the conversion. Call it with the number of centimeters and have it return the value of foot inside the main function. 5
- c) Write a program, which will take three sides of a triangle as input and print whether the triangle is valid or invalid. Hints: Any side of a triangle cannot have value zero or less than that and any two side should be greater than the third one for a triangle to valid. 7

Sample Input	Sample Output
0 -5 7	Invalid
3 4 5	Valid
10 2 110	Invalid

[The question below is Mandatory to answer]

4. a) Write down a program which will take two integers as input and print all the prime numbers within that range 10
- b) Using nested for loop print the following shape (blank positions represent spaces): 6

```

5
 45
 345
2345
12345

```


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MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4273: System Analysis and Design

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

-
1. a) What is System Analysis and System design? Describe the roles of the system analyst. 2+4
- b) What are the main options for the acquisition of computer hardware? Mention their advantages and disadvantages and when to use one option over the others. 8
- c) What are the reasons for project failure? Describe the fishbone diagram with proper examples. 7
- d) What are the differences between MIS and DSS? 4
2. a) Perfect Pizza wants to install a system to record orders for pizza and chicken wings. When regular customers call Perfect Pizza on the phone, they are asked their phone number. When the number is typed into a computer, the name, address, and last order date is automatically brought up on the screen. Once the order is taken, the total, including tax and delivery, is calculated. Then the order is given to the cook. A receipt is printed. Occasionally, special offers (coupons) are printed so that the customer can get a discount. Drivers who make deliveries give customers a copy of the receipt and a coupon (if any). Weekly totals are kept for comparison with last year's performance. 10
- Draw the following dataflow diagrams for Perfect Pizza.
- i. Context Diagram
- ii. Diagram 0
- b) Write short notes on the followings: 8
- i. Present value analysis.
- ii. Leniency, Average tendency and Halo effect
- iii. Break even analysis
- c) Briefly describe the phases of System Development Life Cycle (SDLC). 7
3. a) Define tangible and intangible costs and benefits. Should intangible costs and benefits be considered during analysis? If yes, explain why. 8
- b) IUTWear is a rapidly growing mail-order house specializing in all-cotton clothing. Management would like to expand sales to the Web with the creation of an ecommerce site. The company has two full-time system analysts and one programmer. Company offices are located in a small, isolated town in Bangladesh and the employees who handle the traditional mail-order business have little computer training. 5+5
- i. Considering the company's situation, draw up a list of software attributes that IUTWear should emphasize in its choice of software to create a Web site and integrate the mail order business with business from the Web site.
- ii. Would you recommend COTS software, custom software, or outsourcing to an ASP? State your choice and your reasoning.
- c) What is feasibility study? Explain the main areas of feasibility. 7

4. a) Draw the PERT diagram for the following activities and determine the critical path. Also draw the corresponding Gantt chart, assume you are in week 6 and you may have valid parallel activities in your diagram. 12

Table 1: A list of activities

Activity	Predecessor	Duration (In weeks)
A	None	6
B	None	3
C	B	2
D	A, C	3
E	A, C	4
F	D	2
G	E, F	5
H	B	3
I	G, H	2

- b) What is JAD (Joint Application Development)? Discuss the people who are involved and their respective roles in JAD? Mention some of its advantages and drawbacks. 10
- c) Given ₹ 100 investment, what is the present value of this investment in 10 years? (Hint: Discount rate = 7%) 3

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MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4277: Data Structures and Algorithms

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) Define data structures. What are the components of data structures. 5
 b) What are infix, postfix and prefix expressions? Write down the algorithm to convert infix expressions to postfix. 3+5
 c) Convert the following expressions into postfix: 12
 - i. $A + (B * C - (D / E^F) * G) * H$
 - ii. $D / C + A * A / B * X - E * F / J$

2. a) Evaluate the following Reverse-Polish expression using a stack: 8

$$1\ 2\ 3\ +\ 4\ 5\ 6\ \times\ -\ 7\ \times\ +\ -\ 8\ 9\ \times\ +$$

Show the stack content at each iteration phase.

- b) Write down the algorithm for selection sort. Explain how performance of selection sort can be improved by using a heap instead of an array. Find the worst-case cost for both type of implementations. 13

- c) What is efficiency of an algorithm? Discuss the worst-case analysis of a Binary search. 4

3. a) Write down algorithms for the following functions of a singly linked list: 4+4+3
 - i. Insert_in_position. [It inserts a node in a specific position].
 - ii. Remove_from_position. [Removes a node from a specified position]
 - iii. Insert_at_front. [It inserts new node at the front of the list].

- b) Write short notes of the following. Also mention some real-life applications of the data structures. 4+4
 - i. Stack
 - ii. Queue

- c) Write the sequence of steps required to perform enqueue operation on a queue. 6

4. a) Discuss the best, worst, and average case time complexity of an algorithm. Differentiate between Big-O and little o notations. 4+3

b) Consider the diagram below:

5

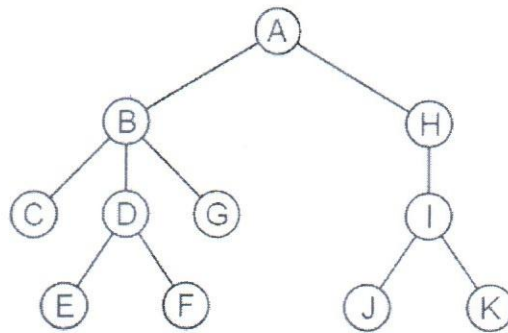
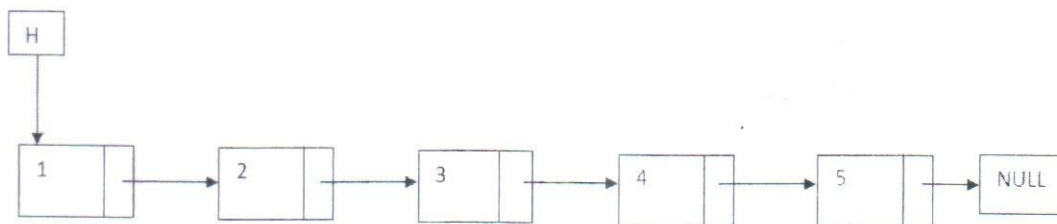


Figure 1: For Question 4.(b)

What is the preorder, inorder and post order traversal of this tree?

c) Create a singly linked list. Keep track of how many nodes are there. Take a position of node from the user. If it is greater than total number of nodes in the linked list show error message otherwise make that node the new head node and take all elements before it to the end of the linked list. See the following diagram for understanding.

13



Node Number: 4|

Output should be as follows:

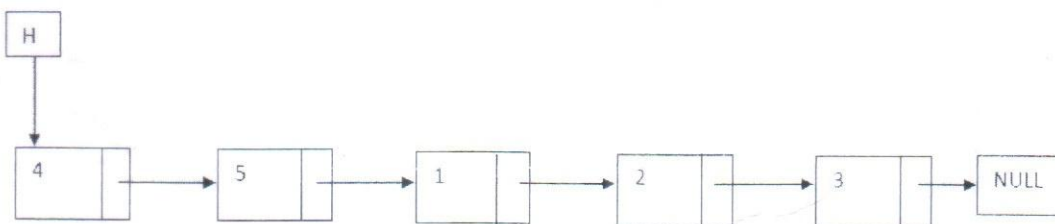


Figure 2: For Question 4.(c)

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DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

SWE 4201: Object Oriented Concepts I

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There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) Define class and object with an example of each. What is the relation between class and object? 5
- b) Organize the following classes into inheritance hierarchies and where appropriate create new classes: Student, Lecturer, Technician, Admin, Postgraduate Student, Undergraduate Student. 10
- c) Explain the terms overloading and overriding with example. 10
2. a) What is an abstract class and why do we need abstract class? 4
- b) Differentiate between static and dynamic polymorphism. 3
- c) What is a constructor? Describe how a constructor works. Can there be more than one constructor for a class? Justify. 10
- d) The following table is supposed to define the access to a field of a class permitted by each modifier in Java. Fill in the blanks of the following table with "Yes" if the field is accessible from the Class/Package/Subclass/World or "No" if it is not accessible: 8

Table 1: Access Level

Modifier	Class	Package	Subclass	World
public				
protected				
no modifier (default)				
private				

3. Every vehicle has a speed, color, and it can turn left and right. A bike is a vehicle which has a gear and rings bell for warning other vehicles in the road. Motor vehicles are special type of vehicles which runs on engine. The motor vehicles have different size of engines (usually measured in CC), license plates and beep horn for giving warning in the road. Among the motor vehicles, motor bike and car are of two types. All motor bikes have a model and cars have specific number of seats. 25

Design the system on the basis of your knowledge on object oriented concept and write code to implement the system.

4. Examine the Figure 1 that contains a section of Java code with several errors. Locate the errors in the code and explain why you believe there is an error at that location. Write the correct code where there is an error.

Note: When you are thinking about one line of code, consider that rest of the code has no errors.

```

1 public abstract class Shape {
2     protected double dim1, dim2;
3     public Shape(double dim1, double dim2) {
4         this.dim1 = dim1;
5         this.dim2 = dim2;
6     }
7     abstract Shape();
8     abstract double area();
9     abstract void draw();
10 }
11 public class Rectangle extends Shape{
12     public Rectangle(double dim1, double dim2) {
13         super(dim1, dim2);
14     }
15     double area() {
16         return dim1 * dim2;
17     }
18     void area() {
19         System.out.println("The area is" + area());
20     }
21     void draw() {
22         System.out.println("Drawing four lines for a rectangle");
23     }
24     double getDiagon() {
25         return Math.sqrt(dim1*dim1 + dim2*dim2);
26     }
27 }
28 public class Triangle extends Shape{
29     public Triangle(double dim1, double dim2) {
30         super(dim1, dim2);
31     }
32     double area() {
33         return (dim1 * dim2)/2;
34     }
35     boolean draw() {
36         System.out.println("Drawing three lines for a triangle");
37         return true;
38     }
39 }
40 public class Main {
41     public static void main(String[] args) {
42         Shape shape = new Shape();
43         Shape rectangle = new Rectangle(10.5, 5.0);
44         System.out.println("Diagonal value of the rectangle is " +
45             rectangle.getDiagon());
46
47         Shape triangle = new Triangle(12, 3);
48         triangle.draw();
49 }

```

Figure 1: Erroneous code (in Java) for Question 4.

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SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

Math 4441: Probability and Statistics

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There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) The post office of a certain small town has only one clerk to wait on customers. The probability that a customer will be served in any given minute is 0.6, regardless of the time that the customer has already taken. The probability of a new customer arriving is 0.45 regardless of the number of customers already in line. The chances of two customers arriving during the same minute are negligible (i.e., the probability is zero). Similarly, the chances of two customers being served in the same minute are negligible (i.e., the probability is zero). Suppose that we start with exactly two customers: one at the postal window and one waiting on line. After 4 minutes, find the probability that there will be exactly four customers: one at the window and three waiting on line. 10
 - b) A *binary digit* or *bit* is a zero or one. A computer assembly language program translator, known as the assembler, translates an assembly language program into a sequence of zeros and ones independently. Assume that each of the translated bits is equally likely to be a zero or one. Let X be the number of independent random bits to be generated until both 0 and 1 are obtained.
 - i. Find the probability mass function of X . 8
 - ii. Find the minimum value of X , so that there will be a 95% chance that the first X bits will have at least one 0 and one 1. 7

2. a) To determine whether or not 100 peoples in a community have a certain disease, they are to have their blood tested. However, rather than testing each individual separately, it has been decided first to group the people in groups of 10. The blood samples of the 10 people in each group will be pooled and analyzed together. If the test is negative, one test will suffice for the 10 people. If the test is positive, each of the 10 people will also be individually tested. Suppose the probability that a person has the disease is 0.10 for all people independently from each other. Let X represent the number of groups with at least one people having the disease, and therefore, all the 10 people of those groups are individually tested. Find the probability mass function of X . 10
 - b) Suppose that two players (A and B) play a series of games that ends when one of them has won i games. Suppose also that each game played is, independently, won by player A with probability p and by player B with probability $(1 - p)$. Let N represent the number of games that are played when $i = 3$. Find the PMF of N . 15

3. a) The time it takes for a student to finish an aptitude test (in hours) has a probability density function of the form

$$f_X(x) = \begin{cases} c(x-1)(2-x), & 1 \leq x \leq 2 \\ 0, & \text{otherwise.} \end{cases}$$
 - i. Determine the value of the constant c . 5

- ii. Calculate the cumulative distribution function of the time it takes for a randomly selected student to finish the aptitude test. 5
- b) Let X , the marks obtained by a randomly selected students in a test of a probability course, be a normal random variable. The professor of the course first finds the average μ and standard deviation σ of the obtained marks of the students, and then assigns letter grades according to the following table: 15

Range of Marks	$X \geq \mu + \sigma$	$\mu \leq X < \mu + \sigma$	$\mu - \sigma \leq X < \mu$	$\mu - 2\sigma \leq X < \mu - \sigma$	$X < \mu - 2\sigma$
Grade	A	B	C	D	F

Determine the percentage of students who will get A, B, C, D, and F grades, respectively.

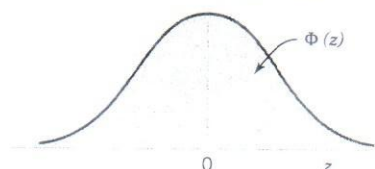
4. a) Two 4-sided fair dice are rolled. The sum of the outcomes is denoted by X and the absolute value of their difference is denoted by Y . 10
- i. Calculate the joint probability mass function of X and Y .
- ii. Find the marginal probability mass function of X .
- b) Suppose that the joint probability density function of two random variables X and Y is given as follows:
- $$f_{XY}(x, y) = \begin{cases} cx^2y, & x^2 \leq y \leq 1, \\ 0, & \text{otherwise.} \end{cases}$$
- i. Determine the value of the constant c . 5
- ii. Find the probability that the random variable X has a value greater than the random variable Y , i.e., $P[X > Y]$. 5
- iii. Find the marginal PDF of random variable X , $f_X(x)$. 5

PMF/PDF, expected value and variance of some known Random Variables

Distribution	PMF/PDF	Expected value	Variance
Bernoulli	$P_X(x) = \begin{cases} 1-p & x=0 \\ p & x=1 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = p$	$Var[X] = p(1-p)$
Geometric	$P_X(x) = \begin{cases} p(1-p)^{x-1} & x \geq 1 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = 1/p$	$Var[X] = (1-p)/p^2$
Binomial	$P_X(x) = \begin{cases} \binom{n}{x} p^x (1-p)^{n-x} & x = 1, \dots, n \\ 0 & \text{otherwise} \end{cases}$	$E[X] = np$	$Var[X] = np(1-p)$
Pascal	$P_X(x) = \begin{cases} \binom{x-1}{k-1} p^k (1-p)^{x-k} & x = k, k+1, \dots \\ 0 & \text{otherwise} \end{cases}$	$E[X] = k/p$	$Var[X] = k(1-p)/p^2$
Poisson	$P_X(x) = \begin{cases} \frac{(\lambda T)^x e^{-\lambda T}}{x!} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = \alpha$ $\alpha = \lambda T$	$Var[X] = \alpha$
Hyper Geometric	$P_X(x) = \frac{\binom{r}{x} \binom{g}{n-x}}{\binom{r+g}{n}}$	$E[X] = \frac{rn}{r+g}$	
Uniform (discrete)	$P_X(x) = \begin{cases} \frac{1}{b-a+1}, & x = a, a+1, a+2, \dots, b \\ 0, & \text{otherwise} \end{cases}$	$E[X] = \frac{a+b}{2}$	$Var[X] = \frac{(b-a)(b-a+2)}{12}$
Exponential	$f_X(x) = \begin{cases} ae^{-ax} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = 1/a$	$Var[X] = 1/a^2$
Gaussian	$f_X(x) = \begin{cases} \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}} & \sigma > 0 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = \mu$	$Var[X] = \sigma^2$
Uniform (Continuous)	$f_X(x) = \begin{cases} \frac{1}{b-a}, & a \leq x < b \\ 0, & \text{otherwise} \end{cases}$	$E[X] = \frac{a+b}{2}$	$Var[X] = \frac{(b-a)^2}{12}$

Appendix A: CDF of Standard Normal Distribution

$$\Phi(z) = P(Z \leq z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}u^2} du$$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.500000	0.503989	0.507978	0.511967	0.515953	0.519939	0.523922	0.527903	0.531881	0.535856
0.1	0.539828	0.543795	0.547758	0.551717	0.555760	0.559618	0.563559	0.567495	0.571424	0.575345
0.2	0.579260	0.583166	0.587064	0.590954	0.594835	0.598706	0.602568	0.606420	0.610261	0.614092
0.3	0.617911	0.621719	0.625516	0.629300	0.633072	0.636831	0.640576	0.644309	0.648027	0.651732
0.4	0.655422	0.659097	0.662757	0.666402	0.670031	0.673645	0.677242	0.680822	0.684386	0.687933
0.5	0.691462	0.694974	0.698468	0.701944	0.705401	0.708840	0.712260	0.715661	0.719043	0.722405
0.6	0.725747	0.729069	0.732371	0.735653	0.738914	0.742154	0.745373	0.748571	0.751748	0.754903
0.7	0.758036	0.761148	0.764238	0.767305	0.770350	0.773373	0.776373	0.779350	0.782305	0.785236
0.8	0.788145	0.791030	0.793892	0.796731	0.799546	0.802338	0.805106	0.807850	0.810570	0.813267
0.9	0.815940	0.818589	0.821214	0.823815	0.826391	0.828944	0.831472	0.833977	0.836457	0.838913
1.0	0.841345	0.843752	0.846136	0.848495	0.850830	0.853141	0.855428	0.857690	0.859929	0.862143
1.1	0.864334	0.866500	0.868643	0.870762	0.872857	0.874928	0.876976	0.878999	0.881000	0.882977
1.2	0.884930	0.886860	0.888767	0.890651	0.892512	0.894350	0.896165	0.897958	0.899727	0.901475
1.3	0.903199	0.904902	0.906582	0.908241	0.909877	0.911492	0.913085	0.914657	0.916207	0.917736
1.4	0.919243	0.920730	0.922196	0.923641	0.925066	0.926471	0.927855	0.929219	0.930563	0.931888
1.5	0.933193	0.934478	0.935744	0.936992	0.938220	0.939429	0.940620	0.941792	0.942947	0.944083
1.6	0.945201	0.946301	0.947384	0.948449	0.949497	0.950529	0.951543	0.952540	0.953521	0.954486
1.7	0.955435	0.956367	0.957284	0.958185	0.959071	0.959941	0.960796	0.961636	0.962462	0.963273
1.8	0.964070	0.964852	0.965621	0.966375	0.967116	0.967843	0.968557	0.969258	0.969946	0.970621
1.9	0.971283	0.971933	0.972571	0.973197	0.973810	0.974412	0.975002	0.975581	0.976148	0.976705
2.0	0.977250	0.977784	0.978308	0.978822	0.979325	0.979818	0.980301	0.980774	0.981237	0.981691
2.1	0.982136	0.982571	0.982997	0.983414	0.983823	0.984222	0.984614	0.984997	0.985371	0.985738
2.2	0.986097	0.986447	0.986791	0.987126	0.987455	0.987776	0.988089	0.988396	0.988696	0.988989
2.3	0.989276	0.989556	0.989830	0.990097	0.990358	0.990613	0.990863	0.991106	0.991344	0.991576
2.4	0.991802	0.992024	0.992240	0.992451	0.992656	0.992857	0.993053	0.993244	0.993431	0.993613
2.5	0.993790	0.993963	0.994132	0.994297	0.994457	0.994614	0.994766	0.994915	0.995060	0.995201
2.6	0.995339	0.995473	0.995604	0.995731	0.995855	0.995975	0.996093	0.996207	0.996319	0.996427
2.7	0.996533	0.996636	0.996736	0.996833	0.996928	0.997020	0.997110	0.997197	0.997282	0.997365
2.8	0.997445	0.997523	0.997599	0.997673	0.997744	0.997814	0.997882	0.997948	0.998012	0.998074
2.9	0.998134	0.998193	0.998250	0.998305	0.998359	0.998411	0.998462	0.998511	0.998559	0.998605
3.0	0.998650	0.998694	0.998736	0.998777	0.998817	0.998856	0.998893	0.998930	0.998965	0.998999
3.1	0.999032	0.999065	0.999096	0.999126	0.999155	0.999184	0.999211	0.999238	0.999264	0.999289
3.2	0.999313	0.999336	0.999359	0.999381	0.999402	0.999423	0.999443	0.999462	0.999481	0.999499
3.3	0.999517	0.999533	0.999550	0.999566	0.999581	0.999596	0.999610	0.999624	0.999638	0.999650
3.4	0.999663	0.999675	0.999687	0.999698	0.999709	0.999720	0.999730	0.999740	0.999749	0.999758
3.5	0.999767	0.999776	0.999784	0.999792	0.999800	0.999807	0.999815	0.999821	0.999828	0.999835
3.6	0.999841	0.999847	0.999853	0.999858	0.999864	0.999869	0.999874	0.999879	0.999883	0.999888
3.7	0.999892	0.999896	0.999900	0.999904	0.999908	0.999912	0.999915	0.999918	0.999922	0.999925
3.8	0.999928	0.999931	0.999933	0.999936	0.999938	0.999941	0.999943	0.999946	0.999948	0.999950
3.9	0.999952	0.999954	0.999956	0.999958	0.999959	0.999961	0.999963	0.999964	0.999966	0.999967

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

Hum 4441: Engineering Ethics

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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- | | | |
|----|---|----|
| 1. | a) What is a profession in general? Discuss the main characteristics of profession from sociological perspective. Which one among them is the most satisfying aspect of profession? Explain with suitable example. | 15 |
| | b) "The concept of profession in the context of sociological perspective has both selfless and self-interest." - Explain in brief. | 5 |
| | c) "Claim to genuine ethical regulation is sometimes seen to be suspicious" - Briefly explain it. | 5 |
| 2. | a) "A social practice is inconceivable without this distinctive aim/objective." - Explain with examples. | 5 |
| | b) Present the definition of profession given by Philosopher Michael Davis. Highlight various important characteristics derived from this definition. | 10 |
| | c) Is Engineering a Profession? Justify in the context of the Socratic Account (i.e. definition given by Davis). | 10 |
| 3. | a) Common morality and personal morality are closely parallel since they have common values in most of the cases. Then why do we not merge them into just one? Justify with example. | 5 |
| | b) Define professional ethics. Describe its major properties. "Professional ethics dominates personal ethics" - Justify it using suitable examples. | 10 |
| | c) Explain the concepts of preventive ethics and aspirational ethics. Mention the main strength of preventive ethics with suitable example. | 10 |
| 4. | a) Explain the term "standard of care" defined by Joshua B. Kardon. Suppose Mr. X is a good computer engineer who works in one of the Scandinavian countries (i.e. Norway, Sweden, and Finland). While Mr. Y is also a good computer engineer who works in one of the developing countries (i.e. Congo, Cuba). They should satisfy the "standard of care" exactly in the same way. Justify your position. | 10 |
| | b) There are three prominent ways in utilitarian thinking. The cost-benefit approach is one of them. Mention other two. Finally explain the major problems with the cost-benefit approach. | 15 |

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4619: Peripherals and Interfacing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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- | | | |
|----|--|----|
| 1. | a) Write a short comparison on Microprocessor and Microcomputer. | 10 |
| | b) Differentiate amongst the followings: | 10 |
| | i. Tiny, Mega and XMega AVRs. | |
| | ii. Synchronous and Asynchronous Transmission. | |
| | c) Suppose, you are given an analog quantization size of <i>1.50 Volt</i> , where $V_{min}=0$ Volt and $V_{max}=20$ Volt. Calculate the desired number of bits for an A/D converter. | 5 |
| 2. | a) What is Aliasing Problem? How to solve it? Briefly explain the conditions to ensure accurate and precise A/D data conversion. | 10 |
| | b) Write the pros and cons of <i>Delta-Sigma</i> and <i>Flash</i> A/D converter. | 8 |
| | c) Suppose, it is given $V_{in} = 0.85$ Volt, $V_{ref} = 1$ Volt and <i>8-bit</i> of resolution for a <i>Successive Approximation</i> A/D converter. Find the <i>6-bit</i> digital output for the given V_{in} . | 7 |
| 3. | a) Differentiate between the working principle of <i>Weighted Sum</i> and <i>R-2R Ladder D/A</i> conversion method. | 10 |
| | b) Suppose, a control register of 8155 PPI has an address of 20h. If the following instructions are executed in an 8085 microprocessor system, then derive the all the port functionalities (i.e., including pins) of the 8155 PPI. | 10 |
| | MVI A, ABh | |
| | OUT 20h | |
| | c) Write the taxonomy of models of transfer in Peripherals and Interfacing along with their features. | 5 |
| 4. | a) 'Data transfer with Interrupt is a microprocessor controlled approach, whereas data transfer with Direct Memory Access (DMA) is a peripheral controlled approach' – True or False? Justify your answer. | 10 |
| | b) Suppose, in a serial system total 30 frames (each having a size of 5 bytes) need to be transmitted. In case of <i>asynchronous transmission</i> , 1 byte overhead occurs either for <i>start</i> or <i>stop</i> byte. In contrast, for <i>synchronous transmission</i> 1 byte of synchronization overhead occurs after each 5 frame transmissions. Mathematically show the performance efficiency comparison between <i>Synchronous Transmission</i> and <i>Asynchronous Transmission</i> . | 10 |
| | c) Write a short note on input handshake signals of 8155 Programmable Peripheral Interface. | 5 |

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ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4617: Artificial Intelligence

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) What is a key limitation of stochastic local search and what is a key advantage? 6
 Consider two local search algorithms, A and B. A solves 85% of a given problem if it is given upto 10 minutes. B solves 35% of the problems it is given upto 55 seconds. Is it wise to use one of the two algorithms at all cases? If not, which algorithm would you use in which conditions?
- b) Consider the search problem represented in the following figure, where a is the start node and e is the goal node. The pair $[f, h]$ at each node indicates the value of the f and h functions for the path ending at that node. 5+2+8

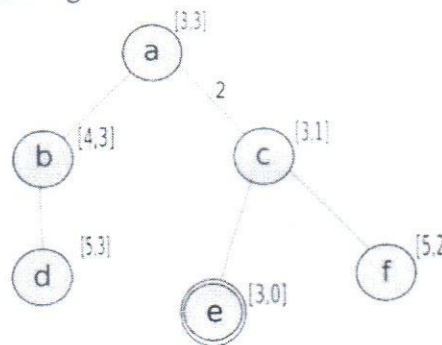


Figure 1: Figure for the Question 1.(b)

- i. Given this information, what is the cost of each arc? The cost $\langle a,c \rangle = 2$ is given as a hint.
- ii. Is the heuristic function h admissible? Explain why or why not.
- iii. Trace A* on this problem. Show what paths are in the frontier at each step. 4
- c) If you use the generic search algorithm as the basis for implementing DFS and BFS, what would be the differences in your implementations?
2. Imagine the following scenario: a family of four needs to figure out how each family member will commute to work or school given several constraints. The family consists of a mother, father, son, and daughter. Each family member can bicycle or ride in the car. Additionally, the son has a pogo stick he can use for commuting to school. The assignment of transportation modes to family members is subject to the following constraints:
- There are only two bicycles.
 - The car can only hold three people.
 - The son and daughter must take the same mode of transportation.
 - The son and daughter can only go by car if at least one of the parents is going by car, i.e. the parent(s) driving them to school.

- a) What are the variables in this problem? What values are in the domain of each variable? [Hint: Read the problem definition carefully and take into consideration which entity is supposed to be assigned values and what values can be assigned to it.] 6
- b) Draw the constraint network for this problem. [Hint: Constraints does not have to be mathematical inequalities/equations] 7
- c) Run Arc consistency on the network by hand and show the final arc-consistent network. You do not have to show each of the steps in arc-consistency, only the final network is enough. 12
3. a) Prove that the worst-case space complexity of IDS is the same as DFS or BFS. If you have two heuristic function $h1$ and $h2$. Give idea of a third heuristic $h3$ which would use $h1$ and $h2$ to achieve a tighter yet admissible heuristic. 9+4
- b) In 1942, Anthony S. Filipiak made a 10-block sliding puzzle called the Traffic Cop Tangle. The point of this puzzle is to swap the positions of the blocks labeled 'A' and 'B', by sliding around the pieces into the empty space (the unlabeled space between the A and the B). [N.B: Picture is to scale, so, both A and B blocks are twice the area of 3 and 6; 3 and 6 have twice the area of 1 and 2] 12

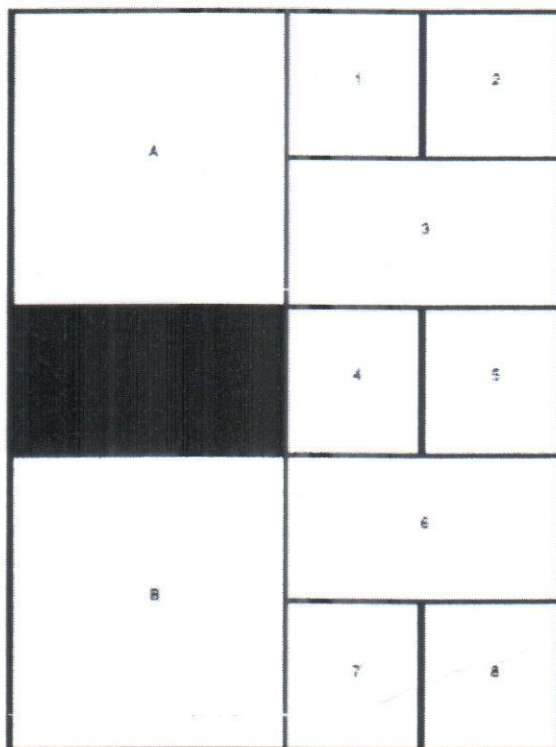


Figure 2: Traffic Cop Tangle Puzzle

Considering the aforementioned puzzle, what constitutes as a state for this problem? What is an action? A goal-state? What is a solution?

4. a) Consider the following simple tree/graph with S as start node and G as goal node. $2+2+4+7$
 Values in nodes determine h values and values on arcs determine path cost from one node to another:

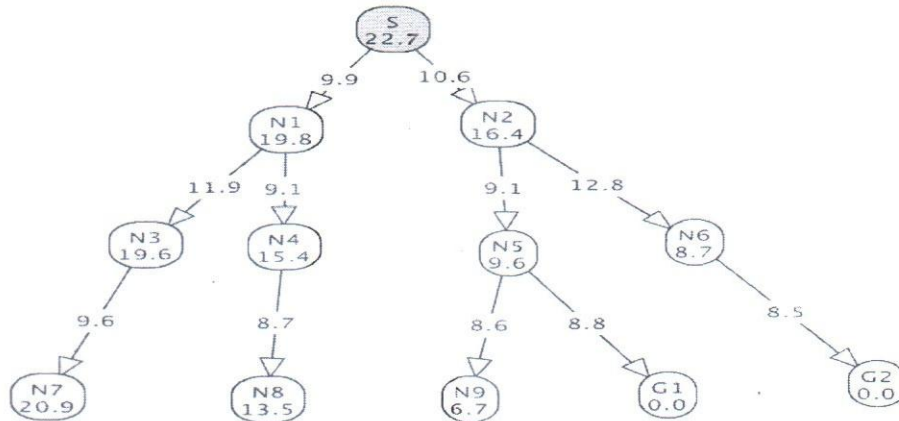


Figure 3: Simple tree/graph with heuristics and edge costs

If you use Branch and Bound (B & B) to solve the problem above then:

- i. What is the UB when only the start node has been explored?
 - ii. Which solution would be found by B & B first?
 - iii. What is the UB immediately after the first goal node is found?
 - iv. What will happen when the algorithm explores the path that leads to the other goal node? Give your insights based on how UB and LB is updated?
- b) Prove that if A* selects a path to the goal, it selects the optimal i.e. lowest cost path.

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ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4631: Digital Signal Processing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) Why is DSP important? Evaluate the necessity of DSP in *Echo Location*. 7
- b) Classify the following signals according to whether they are (1) one- or multi-dimensional, 6
(2) single or multichannel, and (3) analog or digital.
- i. Position of the steering wheel of a car in motion relative to the car's reference frame.
 - ii. Goals scored by the strikers of Real Madrid and Manchester City in FIFA world cup 2018.
- c) A digital communication link carries binary-coded words representing samples of an input signal 12
- $$x_a(t) = \sin 2\pi t + 3 \cos 200\pi t + 15 \sin 5000\pi t + 11 \cos 10000\pi t$$
- This link is operated at 500 bits/s and each input sample is quantized into 1024 different voltage level.
- i. What are the sampling frequency and folding frequency?
 - ii. What is the Nyquist rate for the signal $x_a(t)$?
 - iii. What is the discrete-time signal $x_a[n]$ obtained after sampling?
 - iv. What is the analog signal $y_a(t)$ that we can reconstruct from the samples if we use ideal interpolation?
 - v. What is the resolution Δ ?
2. a) Why is *Shift invariance* important for DSP though it is not a necessity for linear system? 5
- b) Why is decomposition important? Determine and sketch the even and odd parts of the signal 3+4 depicted below:

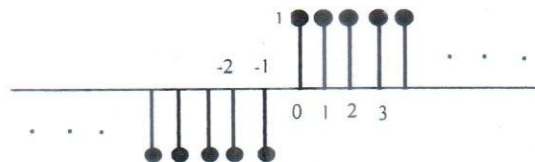


Figure 1: Signal

- c) Find the output of the following operations: 6
- i. $x[n] * \delta[n + 6]$
 - ii. $x[n] * 5\delta[n]$
 - iii. $x[n - 3] * 7\delta[n + 5]$
- d) From calculus, you know that the derivative and integral are inverse operations; one undoes the effect of the other. Prove that the first difference and the running sum are also inverse operations. That is, show that the cascade of these two systems is identical to the delta function. 7

3. a) There are many annoying nuisances associated with using polar notation. What are those? 15
 What possible solution can be used?
- b) Two signals, $x(n)$ and $h(n)$, are defined as follows: 7+3
 $x(n)$: 2, 1, 2, 3, 2, 1, -1, -2, -1, 0, 2, 3, 3, 2, 4, 1 (samples -2 to 13)
 $h(n)$: 3, 2, 1, -3, -2, 1 (samples -3 to 2)
- If $y(n) = x(n) * h(n)$,
- Use the input side convolution algorithm to determine the value of $y(12)$
 - Use the output side convolution algorithm to determine the value of $y(8)$
4. a) Define basis function. Why is it easier to understand the frequency domain in polar notation? 2+6
- b) Suppose, samples from 0 to 32 of the signal $x_d[n]$ of Question 1(c) produces $\mathbf{X}[n]$ as output of DFT. The horizontal axis of $\mathbf{X}[n]$ can be referred to in four different ways. 12
- Draw the horizontal axis of $\mathbf{X}[n]$ showing four notations.
 - Explain which notation is the most important one.
- c) What are the strategies of making the nonlinear system resemble a linear system? 5

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4635: Web Architecture

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) You are asked to design a web application to manage students' attendance. Teachers can take or edit attendance for their respective subjects, can generate attendance report, view attendance sheet, archive attendance records and so on. Students can view their class attendance, get alert for less attendance. Answer the followings:
 - i. What Java technologies are suitable to implement the web application? Justify your answer. 10
 - ii. Draw the appropriate web architectural diagram to design the web application. Explain the web architectural model. 10
 - iii. Describe how you have ensured the concept of 'separation of concerns' through your architectural design solution. 5
2. a) Write the differences between XML and HTML. 5
- b) Consider the following architecture to produce dynamic HTML. Explain the architecture with a real-life example. 8

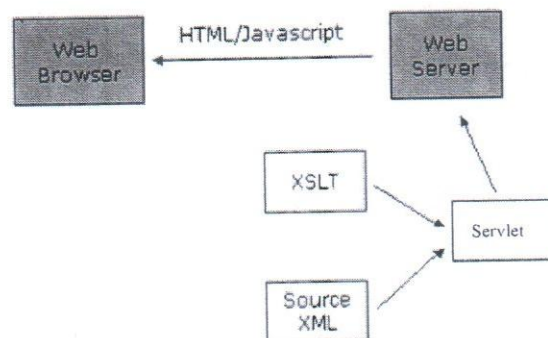


Figure 1: An XML architecture

- c) Suppose you have to provide an XML document for describing invoices for a commerce application. Each invoice includes:
 - An invoice number
 - A date of purchase
 - A billing address
 - A delivery address, if different from the billing address
 - Name and company of purchaser
 - A list of items giving code number, description, quantity ordered, price, and amount due for each item in the invoice.
 - Total amount of the order, in UK pounds.

Answer the followings:

- i. Provide a DTD suitable for defining the class of documents in this format.
- ii. Suppose Mr. X., puts in the following order on 1st February 2018:

6
6

FN-1425	Office Desk	2	£300 each
CE-2311	Mouse Mat	10	£10 each
MS-3829	Pencil	100	£0.50 each

Produce this order in XML, conforming to the DTD you have defined earlier. Include an entity in this document for the name of the purchasing company.

- 3. a) What is a Servlet? Explain the role of a Servlet in MVC approach with example.
- b) What is a session? Suppose, you have the following HTML form in Figure 2.

2+3
10

```
<form action="servlet1">
Name:<input type="text" name="userName"/><br/>
Password:<input type="password" name="pass"/><br/>
<input type="submit" value="Login"/>
```

Figure 2: HTML form

Write a servlet having URL, 'Servlet1' which will set the user name and password in the session scope and write another servlet, 'Servlet2' to get the value from that session scope and display only user name.

- b) What do you mean by Servlet dispatching? Explain the mechanism of Servlet dispatching with example.

10

- 4. a) What is a WAR file? Draw the directory structure of a Java web application containing Servlets, static pages, libraries, images, and configurations files.
- b) Write the differences between ServletConfig and ServletContext interfaces.
- c) Consider the Servlet Filter architecture in Figure 3:

2+6

4

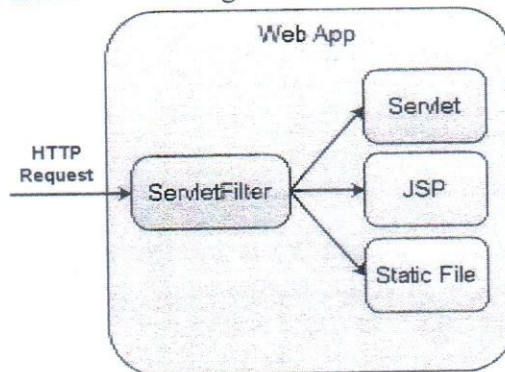


Figure 3: Servlet Filter of a web application

Answer the followings:

- i. Explain the architecture with a real life scenario.
- ii. Give an implementation of your example Servlet Filtering scenario.

6
7

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

Hum 4641: Accounting**Programmable calculators are not allowed. Do not write anything on the question paper.**There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) What do you mean by accounting? Who are the users of accounting information? 10
 b) What is accounting equation? Why must it always balance? 6
 c) Identify the basic steps in the recording process. 9
2. Write short notes on following terms: 5×5
 a) Debit and Credit b) Economic entity c) Accounting Period d) Financial Statements
 e) Accrual and cash basis
3. a) What do you mean by a trial balance? What are the limitations of a trial balance? 7
 b) From the following increase and decrease, find out the transactions (Assume any figure to complete the transactions). 4
 i. An increase in assets and an increase in equity.
 ii. A decrease in assets and a decrease in owner's equity.
 iii. An increase in assets and an increase in liabilities.
 iv. A decrease in assets and decrease in liabilities.
 c) On the basis of above transactions in Question 3.(b), journalize, post to the ledger accounts and prepare a trial balance. 14
4. a) Explain why adjusting entries are needed. 7
 b) Journalize the adjusting entries for December 31st 2017. 18

X Advertising Agency
Trial Balance
December 31st 2017

	Unadjusted		Adjusted	
	Dr.	Cr.	Dr.	Cr.
Accounts Receivable	20,000		21,500	
Arts Supplies	8,600		5,000	
Prepaid Insurance	3,350		2,500	
Printing Equipment	60,000		60,000	
Accumulated depreciation		28,000		33,000
Accounts Payable		5,000		5,000
Interest Payable		0		150
Unearned Advertising Fees		7,200		5,600
Salaries Payable		0		1,300
Share Capital		15,500		15,500
Dividend	12,000		12,000	
Advertising Revenue		58,600		61,700
Salaries Expense	10,000		11,300	
Insurance Expense			850	
Interest Expense	350		500	
Depreciation Expense			5,000	
Arts Supplies Expense			3,600	
	<u>1,14,300</u>	<u>1,14,300</u>	<u>1,22,250</u>	<u>1,22,250</u>

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

Math 4641: Numerical Methods

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) While solving a mathematical model using numerical methods, how can we use relative approximate errors to minimize the error? 5
- b) What do you understand by truncation error? Find out the truncation error of e^x using seven terms of Maclaurin series. Your error should be calculated up to four significant digits. 8
- c) Given that $f(3) = 6$, $f'(3) = 8$, $f''(3) + 1 = 12$ and that all other higher order derivatives of $f(x)$ are zero at $x = 3$, and assuming the function and all its derivatives exist and are continuous between $x = 3$ and $x = 7$. Find out the value of $f(7)$. 12

2. a) Explain the differences between interpolation and regression with appropriate example. 4
- b) A company advertises that every box of chocolate has at least 250 chocolates. The probability that there are 250 or more chocolates in the box is given by 14

$$P(y \geq 250) = \int_{250}^{\infty} 0.3515 e^{-0.3881(y-252.2)^2} dy$$

Approximating the above integral as

$$P(y \geq 250) = \int_{250}^{270} 0.3515 e^{-0.3881(y-252.2)^2} dy$$
 - i. Use single segment Trapezoidal rule to find the probability that there are 250 or more chocolates in a single box.
 - ii. Find the true error, E_t for part (i).
 - iii. Find the absolute relative true error for part (i).
- c) Derive the trapezoidal rule of Integration from Calculus. 7

3. a) Mention the limitations of bisection method with appropriate example. 6
- b) You are working for a start-up computer assembly company and have been asked to determine the minimum number of computers that the shop will have to sell to make a profit. The equation that gives the minimum number of computers to be sold after considering the total costs and the total sales is 13

$$f(n) = 40n^{1.5} - 875n + 35000 = 0$$

Use the Newton-Raphson method of finding roots of equations to find the minimum number of computers that need to be sold to make a profit. Conduct three iterations to estimate the root of the above equations. Also find the absolute relative approximate error at the end of each iteration.

- c) Which method is better between Newton-Raphson and Secant method for finding out the root of a non-linear equation? Justify your answer with appropriate reason. 6

4. a) A robot arm with a rapid laser scanner is doing a quick quality check on holes drilled in a 15"x10" rectangular plate. The centers of the holes in the plate describe the path the arm needs to take, and the hole centers are located on a Cartesian coordinate system (with the origin at the bottom left corner of the plate) given by the specifications in Table 1. 12

Table 1: Dataset for Question 4.(a)

X (in)	Y (in)
2.00	7.2
4.25	7.1
5.25	6.0
7.81	5.0
9.20	3.5
10.60	5.0

If the laser is traversing from $x = 2.00$ to $x = 4.25$ to $x = 5.25$ in a quadratic path, what is the value of y at $x = 4.00$ using the direct method of interpolation and a second order polynomial?

- b) In order to find out the values of $3n$ number of unknowns, you need $3n$ number of equations. How can you get $3n$ number of simultaneous equations from $(n-1)$ data points in Quadratic Spline method of interpolation? 8
- c) What's the motivation behind using Spline method of interpolation instead of direct method of interpolation? Justify your answer with appropriate example. 5

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ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4643: Mobile Application Development

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) Draw Android Activity Lifecycle. What are the key services provided by Android Framework? 9
- b) What is *R.java*? Write down the *XML* code for designing following three buttons given in Figure 1 in Android activity layout. 8



Figure 1: For the Question no. 1.(b)

- c) Define Location Sensitivity with a suitable example. User interfaces are difficult to design and implement for some reasons. Note down some of those reasons. 8
2. a) Suppose you have two smartphones and you ask another person to click your picture. While the person is clicking, you can't know how you are looking in the frame. Now think about an android app named "*Sync camera*" which will sync both the cameras so that you can know whether the photo is being correctly clicked or not. If you are considering building the app, mention three important features that you could offer. Besides, write down five application development challenges and possible solutions for completing your app. 8
- b) What is the process of inserting data into and extracting data from *SharedPreferences* file? Give example with code. 8
- c) Write down any five dangerous permission group names along with their group members which are introduced after Android Marshmallow or 6.0. With the help of a diagram explain *android:gravity* and *android:layout_gravity* function. 9
3. a) If any user is worried about what the app might be doing with the user's information by accessing system permissions, he/she may avoid using the app or uninstall it entirely. What could be possible steps for a developer to avoid such bad user experiences? Briefly discuss the contents of *Resource* directory of Android project. 9
- b) Write down ten recent features added by Android Virtual Devices (AVDs). Mention five limitations of Android Emulator. 8
- c) Write short notes on followings: 8
- i. Doze
 - ii. Toast
 - iii. Intent
 - iv. Content Providers

4. a) How does Mobile Cloud Computing provide benefits for Mobile user? Mention four possible scenarios where the privacy and reliability are violated because of using Mobile Cloud Computing and also try to provide some possible solutions for those problems. 12
- b) Explain four basic approaches for saving energy and extending battery lifetime in mobile devices. Briefly discuss and draw the relationship among Communication, Computation, bandwidth, and offloading. 7
- c) Write down the basic properties of synchronous active transaction and asynchronous active transaction. 6

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4673: Operating System and System Programming

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) What is interrupt handling? Draw a picture of a sample interrupt timeline to explain the process. 10
- b) Draw the storage-device hierarchy and show how storages change in speed, cost and volatility in the hierarchy. 9
- c) What are the differences between virtualization and emulation? Provide appropriate examples. 6
2. a) With the help of figures, explain how MS-DOS layer structure works. 8
- b) Show how FreeBSD runs multiple programs. 7
- c) With figures describe the API-System Call- OS relationship. 10
3. a) With figures explain the states a process go through from creation to termination. 8
- b) What happens when you execute the following C++ code: 8

```
#include <sys/types.h>
int main(){
pid t pid;
    /* fork a child process */
    pid = fork();
    if (pid < 0) { /* error occurred */
        fprintf(stderr, "Fork Failed");
        return 1;
    }
    else if (pid == 0) { /* child process */
        execlp("/bin/ls", "ls", NULL);
    }
    else { /* parent process */
        /* parent will wait for the child to complete */
        wait(NULL);
        printf("Child Complete");
    }
    return 0;
}
```

Figure 1: C++ code

- c) Give an example of an application that uses multiprocess architecture. Explain how multiple processes are created and maintained in that application. 9
4. a) With the help of pictures, show how parameters are passed during system calls. 4
- b) What is cloud computing? What are the various kinds of cloud computing environments that are available in general? With the help of pictures describe the functionalities of various parts in a cloud computing architecture. 13
- c) With the help of pictures, show an example when there would be a transition from user to kernel mode. 8

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MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4801: Compiler Design

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

-
- | | | | |
|----|----|---|----|
| 1. | a) | Discuss the role of <i>symbol table manager</i> and <i>error handler</i> during compilation. | 10 |
| | b) | Write down the algorithm for SLR parsing method along with parser block diagram. | 10 |
| | c) | Discuss on various sentential forms. | 5 |
| 2. | a) | In a proposed programming language variables are needed to be declared as per following format-

<i>data_type var1, var2, var3;</i>

Keywords to declare various types of variables in the proposed language are <i>integer</i> , <i>char</i> and <i>float</i> .

Design a grammar to recognize multiple lines of variable declarations in prescribed format. | 10 |
| | b) | Discuss on various recovery strategies for syntax analysis phase. | 10 |
| | c) | Explain the drawbacks of recursive-descent parsing. | 5 |
| 3. | a) | Write short notes on the following lex variables/functions.

<i>yylex()</i> , <i>yytext</i> , <i>yylen</i> , <i>yywrap()</i> , <i>yyin</i> , <i>ECHO</i> | 12 |
| | b) | Write a lex program which will search email addresses inside a text file. File name will be given to the program as an argument. The program should print following information in new line for each of the detected email address:

<i>email_address, line_number, position_in_line</i> | 13 |
| 4. | a) | Show that the following grammar is ambiguous-

$\text{stmt} \rightarrow \text{if expr then stmt}$ $\quad \quad \quad \text{if expr then stmt else stmt}$ $\quad \quad \quad \text{other}$
Rewrite the grammar by eliminating the ambiguity. | 8 |
| | b) | Find the sets of FIRST and FOLLOW for each non-terminal of the following grammar:

$S \rightarrow A a$ $A \rightarrow B D$ $B \rightarrow b \epsilon$ $D \rightarrow d \epsilon$ | 7 |
| | c) | An SLR parse table is shown in Figure 1 and respective grammar is shown in Figure 2. Show the moves of a SLR parser for validation of input: id*(id+id(| 10 |

STATE	ACTION						GOTO		
	id	+	*	()	\$	E	T	F
0	s5			s4			1	2	3
1		s6				acc			
2		r2	s7		r2	r2			
3		r4	r4		r4	r4			
4	s5			s4			8	2	3
5		r6	r6		r6	r6			
6	s5			s4				9	3
7	s5			s4					10
8		s6			s11				
9		r1	s7		r1	r1			
10		r3	r3		r3	r3			
11		r5	r5		r5	r5			

Figure 1

1. $E \rightarrow E + T$
2. $E \rightarrow T$
3. $T \rightarrow T * F$
4. $T \rightarrow F$
5. $F \rightarrow (E)$
6. $F \rightarrow id$

Figure 2

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS:75

CSE 4803: Parallel and Distributed Processing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) What is meant by transparency? Differentiate between migration and relocation transparency with example. 5
- b) Why it is not always a good idea to aim at implementing the highest degree of transparency possible? 5
- c) You are asked to explain the following architecture in which a service using several application/compute servers serves client requests. How can this architecture help to improve the performance of the service? 7

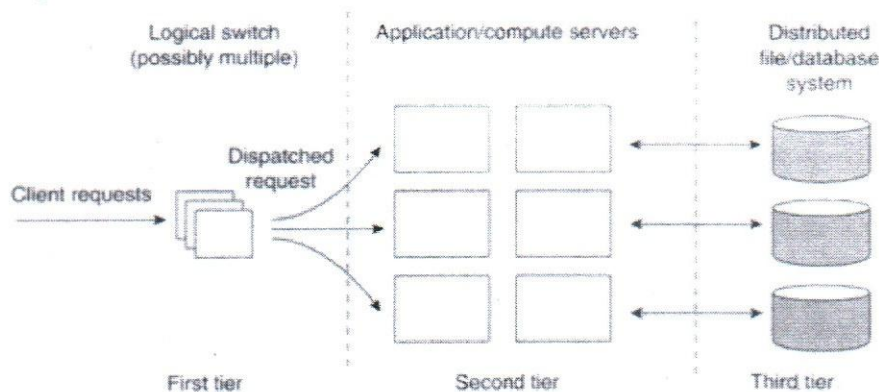


Figure 1: Distributed System Architecture

- d) What do you mean by thin client and fat client? Explain Alternative client-server organization with example. 8
2. a) Suppose you are tasked to create a distributed system for a fast food chain restaurant which provides tasty foods all over the world from various outlets. To order food from these outlets, consumers have to insert the first name and email along with the security PIN into a client's machine at every outlet. They will also have to insert the foods they want to order. Unlike most restaurants, here the users refill their accounts with monetary transactions, similar to a prepaid system and then they can order food using credits stored in their accounts. Design the system in such a way that the Authentication server and Menu Information server are different. How can you put a middleware so that each transaction is processed by single request/reply message from/to the clients' end? 7
 - b) Describe the Publish/Subscribe paradigm. Use a diagram and include a description of the API used in a Publish/Subscribe system 6
 - c) What is super-peer? Give an example how a super-peer can be selected and under which circumstances that would be necessary. 6
 - d) Suppose you are tasked to design a Smart Home System where each electric appliance's data are monitored by a Distributed Network. Data from each appliances are stored in a centralized database for the occupants to monitor. The doctors can search by appliance's ID to find out the current status and regulate voltage. Design the system in a three level architecture and find out the benefits of such architecture in terms of performance, scalability and maintenance. 6

3. a) Suppose you are asked to develop a distributed application using DCE/RPC. Explain how your code will be compiled and how the server stub and client stub will be linked? Use flowchart for explanation. 10
- b) What are Client and Server Stubs and how are they used in remote procedure calls? 7
- c) With an example explain the process of parameter marshaling in a remote communication through RPC. 8
4. a) Suppose in a structured peer-to-peer communication there can be at most 30 machines. If they implement Chord System to track all the machines as well as the resources, let's assume that the 10 machines online have the following IDs: 1, 4, 7, 9, 11, 14, 18, 20, 21, 28. Also assume that the length of finger table is 5. Develop finger tables for each node and describe the process for locating a resource with key 26. 8
- b) Describe the relative advantages and disadvantages of iterative and recursive name resolution in a distributed naming service. 7
- c) What is symbolic link and hard link? Explain with proper figure. 5
- d) Suppose an entity is registered in Dhaka. Suddenly it has moved to Chittagong. The network of Dhaka and Chittagong is different. How to locate this entity? Explain with figure. 5

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4807: IT Project Management

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. It may surprise you that two snowboard enthusiasts who simply wanted a better way to sell their snowboards online have created an e-commerce platform that now has over \$275 million in sales and hosts more than 20 000 online retailers, including Pixar, Angry Birds, and the Foo Fighters. Tobias Lütke, CEO and founder, has created a business that allows companies of all sizes to set up their own online store, taking a task that used to take months and trimming it down to as little as half an hour. *Shopify* takes care of everything behind the scenes in return for a subscription fee and transaction fees.
 The business model that follows mainly deals with other businesses. Given the scenario, answer the following questions.
 - a) As the CEO of *Shopify*, what are the skillsets that Tobias Lütke requires? Why? 5
 - b) According to Henry Mintzberg, a prominent management researcher at McGill University, a manager has to perform certain roles in an organization. Considering *Shopify* as an organization which conducts business with other business organizations, what should be the roles of Tobias Lütke in orchestrating such a successful organization as *Shopify*? 12
 - c) Why are we calling an online platform like *Shopify* an organization? What type of organization is *Shopify*? Explain your answer. 4+4

2. a) You work for a medium-sized IT consulting firm in Quebec. You submit the lowest bid for a government contract. You do not have the staffing in place to meet the contract at the moment and you anticipate that it will take you three months longer than your main competitor to build the IT infrastructure awarded in the contract. Your government client asks for details on your schedule before awarding the contract to you or your main competitor.
 In this case what is the most ethical decision you can make? Moreover, which decision would be the most beneficent for your firm? Explain both of your answers. 5+5
 - b) How do different organizations do business globally? 10
 - c) Discuss the pros and cons of Globalization. 5

3. a) With proper examples, describe the Strategic Management Process which includes detailed discussion on SWOT analysis and PESTEL analysis. 20
 - b) What do you understand by MBO? 5

4. a) How is Management universal? What are the four common functions that managers perform? Describe each of them briefly. 2+8
 - b) Describe the components of Specific and general environments. 8
 - c) What are the steps that managers follow to set up goals? Discuss them briefly. 7

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MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4831: Simulation, Modeling and Performance Evaluation

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. A one-pump gas station is always open and has two types of customers. A police car arrives every 30 minutes (exactly), with the first police car arriving at time 15 minutes. Regular (nonpolice) cars have exponential interarrival times with mean 5.6 minutes, with the first car arriving at time 0. Service time at the pump for all cars are exponential with mean 4.8 minutes. A car arriving to find the pump idle goes right into service, and regular cars arriving to find the pump busy join the end of a single queue. A police car arriving to find the pump busy, however, goes to the front on the line, ahead of any regular cars in the line. [If there are already other police cars at the front of the line, assume that an arriving police car gets in line ahead of them as well.]
Initially, the system is empty and idle, and the simulation is to run until exactly 500 cars (on any type) have completed their delays in queue. The purpose of the simulation is to improve the system in terms of the followings: average delay in queue for each type of car, the time-average number of cars in queue, and the utilization of the pump.
 - a) What are the state variables and output variables for the simulation model? 7
 - b) Identify the set of events for the simulation model. 5
 - c) Write down the state equations and output equations for the simulation model. 10
 - d) Write down the state space for the simulation model. 3

2. For the scenario given in Question 1, answer the followings:
 - a) Draw a sample path of the system for a few customers showing the change of the state variable(s) over time. 5
 - b) Draw separate flow charts of the event routines (i.e., the event handler functions) for each of the events of the system. 12
 - c) Draw the flow chart of the function that updates the necessary statistical variables according to the output equations of the simulation model. 8

3.
 - a) Define and differentiate between Random Numbers and Pseudo-Random Numbers 7
 - b) Without actually computing any Z_i 's, determine whether the following to LCGs have full period: 8
 - i. $Z_i = (13Z_{i-1} + 13)(\text{mod } 16)$
 - ii. $Z_i = (Z_{i-1} + 12)(\text{mod } 13)$
 - c) Generate 10 random numbers using the midsquare method for $Z_0 = 7367$. Discuss the disadvantages of this method. 10

4. a) A mass is connected to a fixed point by a spring. At time $t = 0$, the mass is displaced from its rest position by an amount $u(0) = u_0 > 0$ and released. The displacement at any time $t > 0$, denoted by $y(t)$ is to be measured. Determine whether an input-output modeling or a state space modeling is appropriate for this system. Justify your answer. 8

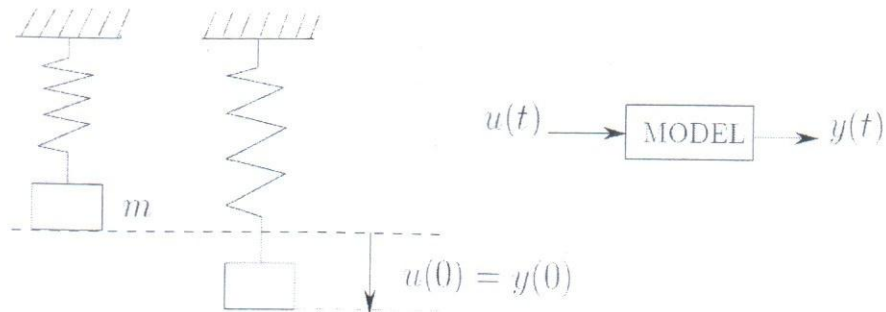


Figure 1: System for Question 4(a)

- b) Differentiate between the followings: 9
- i. Static and Dynamic Systems
 - ii. Time-Varying and Time-Invariant Systems
 - iii. Deterministic and Stochastic Systems
- c) Discuss the steps involved in developing the computational model of a system with an appropriate example. 8

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4835: Pattern Recognition

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

-
1. a) Define Pattern Recognition. Briefly describe the design cycle of a pattern recognition system with appropriate figures. 1+13
- b) Compare between the different types of learning methods with examples. 6
- c) What is a class model? How is the class model related to the class decision? 1+4
2. a) Devise the decision rule for the Bayes classifier with minimum risk for a two-class problem. When can this classifier ensure minimum error? Prove it. 4+4
- b) Consider the following decision rule for a two-class one dimensional problem: 7
- Decide ω_1 if $x > \theta$; otherwise decide ω_2 .
- Show that the probability of error for this rule is given by:
- $$P(\text{error}) = P(\omega_1) \int_{-\infty}^{\theta} p(x | \omega_1) dx + P(\omega_2) \int_{\theta}^{\infty} p(x | \omega_2) dx$$
- c) Find the weight vector w and bias w_0 for the discriminant function $g(x)$ of Bayes classifier with minimum error rate. Assume that the likelihood probability follows a multivariate normal density function. What conditions are required for this classifier to behave same as a distance classifier? 8+2
3. a) Why is Whitening Transform essential? How do you perform it? 2+3
- b) When is the Mahalanobis distance measure better than the Euclidean distance? Explain with an example scenario. 5
- c) What is a phi-function? How does this function map a non-linear discriminant function into a linear discriminant function? Design a phi function of your own when the original feature space is three dimensional. 2+4
- d) There are generally three ways to devise multicategory classifiers employing linear discriminant functions. Describe each of such designs along with their pros and cons. Use necessary illustrations. 9
4. a) You are given the following sample points in a 2-class problem: 5
- $S_1: (1,1), (1,-1), (2,3)$
- $S_2: (2,1), (0,1), (2,1)$
- Plot these samples (use graph paper) and determine by inspection whether they are separable with a linear decision boundary.
- b) Find the equation of a decision boundary which can correctly classify all the samples in Question 4.(a). Show all calculations required with the Gradient-Descent technique. Choose any criterion function. Assume any values for necessary variables. 20

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4873: IT Project Management

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

-
- | | | |
|----|---|-----|
| 1. | a) What are the most important skillsets that managers require? Which skill is required at which level of management? | 5+2 |
| | b) According to Henry Mintzberg, a prominent management researcher at McGill University, a manager has to perform certain roles in an organization. Describe them briefly. | 12 |
| | c) What are the common characteristics of an organization? | 6 |
| 2. | a) What are the differences between <i>Omnipotent view of Management</i> and <i>Symbolic view of Management</i> ? | 5 |
| | b) Hofstede developed one of the most widely referenced approaches to helping managers better understand differences between national cultures. Discuss the dimensions along which a manager should look to understand different national cultures. | 15 |
| | c) Discuss the pros and cons of Globalization. | 5 |
| 3. | a) What do you understand by SWOT analysis and PESTEL analysis? Describe them elaborately with appropriate examples. | 16 |
| | b) Discuss the differences between Traditional Management and MBO. | 4 |
| | c) What are the most important purposes of planning for a manager? | 5 |
| 4. | a) What are the primary criticisms directed at formal planning? | 10 |
| | b) Describe the components of Specific and general environments. | 8 |
| | c) What are the steps that managers follow to set up goals? Discuss them briefly. | 7 |

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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4885: Human-Computer Interaction

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (Four)** questions. Answer any **3 (Three)** of them.

Figures in the right margin indicate marks.

1. a) A computer game manufacturer is producing a new game called Gulliver. In this game the players travel through a virtual landscape in which are found various villages. Some of these villages are occupied by Lilliputians, who are only 6 inches tall; some by ordinary people; and some by Brobdingnagians, who are giants. The game uses a fully **immersive VR headset**. You have been asked to advise the game makers. 12+5
- i. If the user “stands still” in the virtual environment, a Lilliputian village that is very close, a normal village some way off and a Brobdingnagian village in the far distance will all look the same apparent size. What visual cues can the designers use to enable a user to distinguish them? (Say in your answer if any cues are better at distinguishing the miniature village from the normal one, or the normal one from the giant one.)
- ii. How does this change when the user is allowed to move in the environment?
- b) *Cognition* is the process by which the human gain knowledge from the environment. Write the name of different processes which contribute to the cognition. 8
2. a) The use of color in displays is an ergonomics issue in HCI. The visual system has some limitations with regard to color. Which color conventions we should remember as ergonomic guidelines when we use color in displays? 7
- b) The *model human processor (MHP)* consists of three interacting systems. Each has its own memory and processor. With necessary diagram describe the complete MHP. 10
- Ergonomics attempt to make sure that the task is structured to fit the person performing it and in this regard it defines standards and guidelines. 8

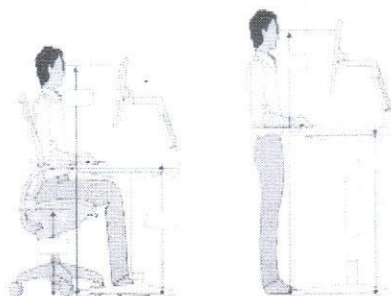


Figure 1: Traditional and standing desk environment

Write some recommendations related to ergonomic issues for traditional and standing desks environment to use a computer. (Figure 1)

3. a) Human visual system perceives the 3D information regarding an object using both physiological and psychological cues. Briefly describe those cues using suitable examples. 8
- b) Interaction can be seen as a dialog between the computer and the user. The choice of interface style can have a profound effect on the nature of this dialog. Write the name of the most common *interface styles* and note the different effects these have on interaction shortly. Draw figures where they are required. 7
- c) Interaction design is a trend in industrial design that emphasizes the role of the user. Describe different phases involved in the process of interaction design with necessary figures and examples. Also mention the core characteristics and goals of interaction design procedure. 10
4. a) Define the following terms used in HCI: 10
- Visual acuity
 - Saccades
 - Fixations
 - Regressions
 - Kinesthesia
- b) What is the *golden rule of design* followed in HCI? Explain with relevant examples. 5
- c) What do you mean by 'gulf of execution' and 'gulf of evaluation' while doing interaction through computers? Consider the interaction framework in Figure 2. 10
- Answer the followings:
- Redraw the framework indicating two gulfs (show in the figure) in the user interface
 - In *Microsoft File Explorer* software, mention some poor mappings of articulation, performance, presentation, and observation.
 - How different types of human error are related to these terms?

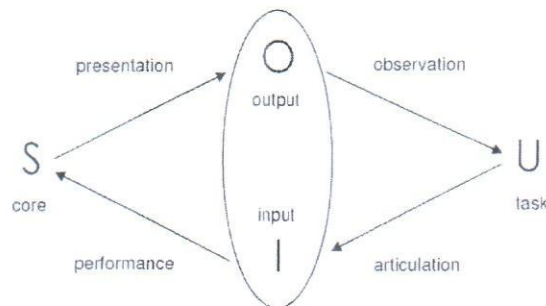


Figure 2: An Interaction Framework

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION
DURATION: 1 Hour 30 Minutes

SUMMER SEMESTER, 2017-2018
FULL MARKS: 75

CSE 6255: Advanced Internet Computing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) Briefly discuss on various types of Internet Computing applications including the technologies you will use for the implementation. 10
 b) Explain the structure of HTTP transactions with example. 10
 c) Can you run multiple TCP applications in a single server machine? Explain your answer. 5

2. a) What is XML? Mention different applications of XML. 5
 b) Suppose you want to design a 'StudentML' language. It would contain, student id, name, department, CGPA, and program. Define your own XML tags to describe student information. Use appropriate attributes and properties as XML elements. 10
 c) What is XSLT? Using XSLT elements write an XSL file to display only the name of the students having CGPA greater than 3.15. 10

3. a) With an example Servlet code explain how you can construct a front-end controller as a delegator to access different web resources. 10
 b) What is session tracking? Show a simple servlet that uses session tracking to count the number of times a client has accessed a web page. 10
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4. a) What is JSTL? Write a JSP code using JSTL which will print numeral values from one to ten. 8
 b) Suppose you want to implement a distributed web application according to the architecture given in Figure 1. Redraw the architecture using appropriate links and labeling to different components and explain with a real life example. 10

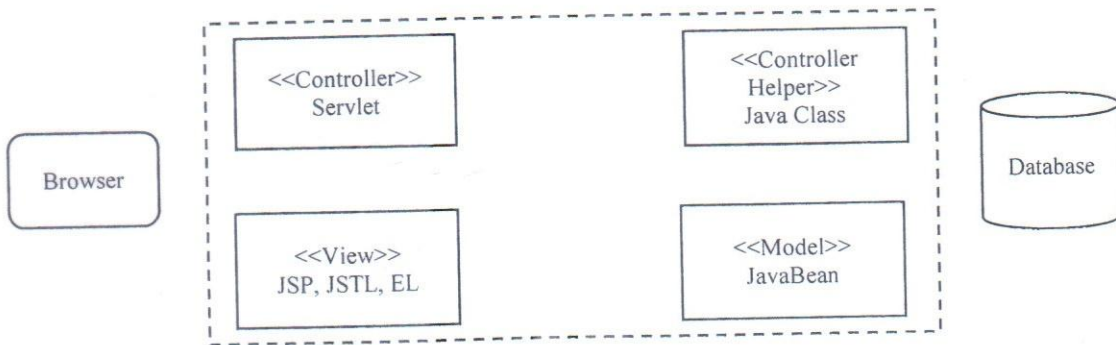


Figure 1: An Internet application architecture

- c) Suppose you have a HTML form whose source code is shown in Figure 2. Write a JSP page using JSP Expression Language (EL) to fetch 'student name' and 'roll number' using 'param' variable and display in a JSP page named 'display.jsp'.

```
<html>
<head>
  <title>Expression language example2</title>
</head>
<body>
<form action="display.jsp">
Student Name: <input type="text" name="stuname" /><br>
Student RollNum:<input type="text" name="rollno" /><br>
<input type="submit" value="Submit Details!!"/>
</form>
</body>
</html>
```

Figure 2: An HTML form

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 6261: Advanced Probability and Stochastic Process

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) A biased coin with probability of obtaining a head equal to p (where $0 < p < 1$) is tossed repeatedly and independently until the first head is observed. Compute the probability that the first head appears at an even numbered toss. 10
- b) Information is transmitted digitally as a binary sequence known as "bits". However, noise on the channel corrupts the signal, in that a digit transmitted as 0 is received as 1 with probability 0.1, with a similar random corruption when the digit 1 is transmitted. It has been observed that, across a large number of transmitted signals, the 0s and 1s are transmitted in the ratio 3:4. 15

Given that the sequence 101 is received, what is the probability distribution over transmitted signals? Assume that the transmission and reception processes are independent.

2. a) A particular circuit works if all 10 of its component devices work. Each circuit is tested before leaving the factory. Each working circuit can be sold for k dollars, but each nonworking circuit is worthless and must be thrown away. Each circuit can be built with either ordinary devices or ultrareliable devices. An ordinary device has a failure probability of $q = 0.1$ while an ultrareliable device has a failure probability of $\frac{q}{2}$, independent of any other device. However, each ordinary device costs \$1 while an ultrareliable device costs \$3. Should you build your circuit with ordinary devices or ultrareliable devices in order to maximize your expected profit $E[R]$? Keep in mind that your answer will depend on k . 13
- b) An urn contains r red balls and b blue balls. Suppose n (where n less than r and b) balls are randomly picked from the urn without replacement. Find the probability that more red balls are picked than blue balls. Note that you need to consider both the even and odd values of n . 12
3. a) Suppose that the IQ of a randomly selected student from a university is normal with mean 110 and standard deviation 20. Determine the interval of values that is centered at the mean and includes 50% of the IQ's of the students at that university. 10
- b) In data communication, messages are usually combinations of characters, and each character consists of a number of bits. A bit is the smallest unit of information and is either 1 or 0. Suppose that L , the length of a character (in bits) is a geometric random variable with parameter p . If a sender emits messages at the rate of 1000 bits per second, what is the distribution of T , the time it takes the sender to emit a character? 8
- c) A point is chosen at random on a line segment of length L . Find the probability that the ratio of the shorter to the longer segment is less than $\frac{1}{4}$. 7

4. a) Thieves stole four animals at random from a farm that had seven sheep, eight goats, and five cows. Calculate the joint probability mass function of the number of sheep and goats stolen. 10
- b) Suppose random variable X and Y are jointly distributed with the following joint probability distribution function 15

$$f_{XY}(x, y) = \begin{cases} 2, & 0 \leq x \leq y \leq 1 \\ 0, & \text{otherwise.} \end{cases}$$

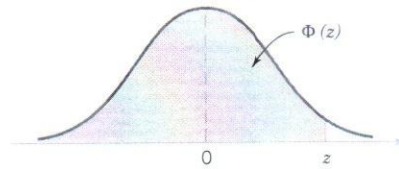
Find the joint cumulative distribution function of X and Y .

PMF/PDF and the expected values of some Random Variables

Distribution	PMF/PDF	Expected value	Variance
Bernoulli	$P_X(x) = \begin{cases} 1-p & x=0 \\ p & x=1 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = p$	$Var[X] = p(1-p)$
Geometric	$P_X(x) = \begin{cases} p(1-p)^{x-1} & x \geq 1 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = 1/p$	$Var[X] = (1-p)/p^2$
Binomial	$P_X(x) = \begin{cases} \binom{n}{x} p^x (1-p)^{n-x} & x = 1, \dots, n \\ 0 & \text{otherwise} \end{cases}$	$E[X] = np$	$Var[X] = np(1-p)$
Pascal	$P_X(x) = \begin{cases} \binom{x-1}{k-1} p^k (1-p)^{x-k} & x = k, k+1, \dots \\ 0 & \text{otherwise} \end{cases}$	$E[X] = k/p$	$Var[X] = k(1-p)/p^2$
Poisson	$P_X(x) = \begin{cases} \frac{(\lambda T)^x e^{-\lambda T}}{x!} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = \alpha$ $\alpha = \lambda T$	$Var[X] = \alpha$
Uniform (discrete)	$P_X(x) = \begin{cases} \frac{1}{b-a+1}, & x = a, a+1, a+2, \dots, b \\ 0, & \text{otherwise} \end{cases}$	$E[X] = \frac{a+b}{2}$	$Var[X] = \frac{(b-a)(b-a+1)}{12}$
Exponential	$f_X(x) = \begin{cases} ae^{-ax} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = 1/a$	$Var[X] = 1/a^2$
Gaussian	$f_X(x) = \begin{cases} \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}} & \sigma > 0 \\ 0 & \text{otherwise} \end{cases}$	$E[X] = \mu$	$Var[X] = \sigma^2$
Uniform (Continuous)	$f_X(x) = \begin{cases} \frac{1}{b-a}, & a \leq x < b \\ 0, & \text{otherwise} \end{cases}$	$E[X] = \frac{a+b}{2}$	$Var[X] = \frac{(b-a)^2}{12}$

Appendix A: CDF of Standard Normal Distribution

$$\Phi(z) = P(Z \leq z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}u^2} du$$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.500000	0.503989	0.507978	0.511967	0.515953	0.519939	0.532922	0.527903	0.531881	0.535856
0.1	0.539828	0.543795	0.547758	0.551717	0.555760	0.559618	0.563559	0.567495	0.571424	0.575345
0.2	0.579260	0.583166	0.587064	0.590954	0.594835	0.598706	0.602568	0.606420	0.610261	0.614092
0.3	0.617911	0.621719	0.625516	0.629300	0.633072	0.636831	0.640576	0.644309	0.648027	0.651732
0.4	0.655422	0.659097	0.662757	0.666402	0.670031	0.673645	0.677242	0.680822	0.684386	0.687933
0.5	0.691462	0.694974	0.698468	0.701944	0.705401	0.708840	0.712260	0.715661	0.719043	0.722405
0.6	0.725747	0.729069	0.732371	0.735653	0.738914	0.742154	0.745373	0.748571	0.751748	0.754903
0.7	0.758036	0.761148	0.764238	0.767305	0.770350	0.773373	0.776373	0.779350	0.782305	0.785236
0.8	0.788145	0.791030	0.793892	0.796731	0.799546	0.802338	0.805106	0.807850	0.810570	0.813267
0.9	0.815940	0.818589	0.821214	0.823815	0.826391	0.828944	0.831472	0.833977	0.836457	0.838913
1.0	0.841345	0.843752	0.846136	0.848495	0.850830	0.853141	0.855428	0.857690	0.859929	0.862143
1.1	0.864334	0.866500	0.868643	0.870762	0.872857	0.874928	0.876976	0.878999	0.881000	0.882977
1.2	0.884930	0.886860	0.888767	0.890651	0.892512	0.894350	0.896165	0.897958	0.899727	0.901475
1.3	0.903199	0.904902	0.906582	0.908241	0.909877	0.911492	0.913085	0.914657	0.916207	0.917736
1.4	0.919243	0.920730	0.922196	0.923641	0.925066	0.926471	0.927855	0.929219	0.930563	0.931888
1.5	0.933193	0.934478	0.935744	0.936992	0.938220	0.939429	0.940620	0.941792	0.942947	0.944083
1.6	0.945201	0.946301	0.947384	0.948449	0.949497	0.950529	0.951543	0.952540	0.953521	0.954486
1.7	0.955435	0.956367	0.957284	0.958185	0.959071	0.959941	0.960796	0.961636	0.962462	0.963273
1.8	0.964070	0.964852	0.965621	0.966375	0.967116	0.967843	0.968557	0.969258	0.969946	0.970621
1.9	0.971283	0.971933	0.972571	0.973197	0.973810	0.974412	0.975002	0.975581	0.976148	0.976705
2.0	0.977250	0.977784	0.978308	0.978822	0.979325	0.979818	0.980301	0.980774	0.981237	0.981691
2.1	0.982136	0.982571	0.982997	0.983414	0.983823	0.984222	0.984614	0.984997	0.985371	0.985738
2.2	0.986097	0.986447	0.986791	0.987126	0.987455	0.987776	0.988089	0.988396	0.988696	0.988989
2.3	0.989276	0.989556	0.989830	0.990097	0.990358	0.990613	0.990863	0.991106	0.991344	0.991576
2.4	0.991802	0.992024	0.992240	0.992451	0.992656	0.992857	0.993053	0.993244	0.993431	0.993613
2.5	0.993790	0.993963	0.994132	0.994297	0.994457	0.994614	0.994766	0.994915	0.995060	0.995201
2.6	0.995339	0.995473	0.995604	0.995731	0.995855	0.995975	0.996093	0.996207	0.996319	0.996427
2.7	0.996533	0.996636	0.996736	0.996833	0.996928	0.997020	0.997110	0.997197	0.997282	0.997365
2.8	0.997445	0.997523	0.997599	0.997673	0.997744	0.997814	0.997882	0.997948	0.998012	0.998074
2.9	0.998134	0.998193	0.998250	0.998305	0.998359	0.998411	0.998462	0.998511	0.998559	0.998605
3.0	0.998650	0.998694	0.998736	0.998777	0.998817	0.998856	0.998893	0.998930	0.998965	0.998999
3.1	0.999032	0.999065	0.999096	0.999126	0.999155	0.999184	0.999211	0.999238	0.999264	0.999289
3.2	0.999313	0.999336	0.999359	0.999381	0.999402	0.999423	0.999443	0.999462	0.999481	0.999499
3.3	0.999517	0.999533	0.999550	0.999566	0.999581	0.999596	0.999610	0.999624	0.999638	0.999650
3.4	0.999663	0.999675	0.999687	0.999698	0.999709	0.999720	0.999730	0.999740	0.999749	0.999758
3.5	0.999767	0.999776	0.999784	0.999792	0.999800	0.999807	0.999815	0.999821	0.999828	0.999835
3.6	0.999841	0.999847	0.999853	0.999858	0.999864	0.999869	0.999874	0.999879	0.999883	0.999888
3.7	0.999892	0.999896	0.999900	0.999904	0.999908	0.999912	0.999915	0.999918	0.999922	0.999925
3.8	0.999928	0.999931	0.999933	0.999936	0.999938	0.999941	0.999943	0.999946	0.999948	0.999950
3.9	0.999952	0.999954	0.999956	0.999958	0.999959	0.999961	0.999963	0.999964	0.999966	0.999967

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 6265: Advanced Digital Image Processing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

-
1. a) Define the following terms: 2×5
- i. Digital Image
 - ii. Linear Operator
 - iii. m -adjacency
 - iv. Spatial Resolution
 - v. Brightness
- b) Suppose you have a gray-scale image of size 50×50 pixels. Your job is now to expand this image to a size of 732×732 pixels. How can you carry out this expansion with less amount of blocking effects? 8
- c) Suppose that an area with center at (x_0, y_0) is illuminated by a light source with intensity distribution of $i(x, y) = Ke^{-[(x-x_0)^2 + (y-y_0)^2]}$. 7
Assume for simplicity that the reflectance of the area is constant and equal to 1.0, and let $K=255$. If the resulting image is digitized with k bits of intensity resolution, and the eye can detect an abrupt change of eight shades of intensity between adjacent pixels, what value of k will cause visible false contouring?
2. a) Draw a single intensity transformation function for spreading the intensities of a gray-scale image so the lowest intensity is 0 and the highest is $(L-1)$. Here L is the number of intensities possible. Give the mathematical definition of your transformation function. 4+4
- b) 'A perfectly histogram equalized (HE) 8-bit gray-scale image will have an average intensity at the middle of its intensity range' – Justify this statement. 7
- c) An automobile manufacturer is automating the placement of certain components on the bumpers of a limited-edition line of sports cars. The components are color coordinated, so the robots need to know the color of each car in order to select the appropriate bumper component. Models come in only four colors: blue, green, red, and white. You are hired to propose a solution based on imaging. How would you solve the problem of automatically determining the color of each car, keeping in mind that cost is the most important consideration in your choice of components? 10
3. a) Give the mathematical equation representing the correlation of a filter $w(x,y)$ with an image $f(x,y)$. Show the results of applying a Sobel filter on an image of size 5×5 pixels. Explain four different outputs (i.e., at four different positions) of the correlation response with that filter. 10
- b) Explain why the output of applying a median filter preserves more edge sharpness in compared to that of applying an averaging filter. 8
- c) What is isotropic filter? Prove that a Gradient mask is not isotropic. 2+5

4. a) Write short notes on the following color models. Draw appropriate figures. 4+4
- i. HSI
 - ii. CMYK
- b) How can you apply the High-boost filter operation on a 24-bit RGB color image without any effect on its color information? Explain the working mechanism of High-boost filter too. 7
- c) Consider a color image corrupted by adding Gaussian noise (with same parameters) separately to each of its RGB channels. Now you have converted the RGB color image to HSI counterpart and found noise to be significantly visible in H and S channels. However, the presence of noise is less visible in the I channel. Explain why. 10

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2017-2018

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 6269: Embedded Systems Design

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them including **Question 1 (mandatory)**.

Figures in the right margin indicate marks.

[Mandatory]

1. a) Briefly describe the architecture of Arduino board. 10
 b) In IUT, a smart classroom has been designed that operates with a controlling smart card. 15
 With the touch of the controlling card, the computer, air conditioners, attendance system, smart boards are enabled. Briefly describe the architecture, sensor and actuator deployment for the smart class.

2. a) ADC being cheaper than dealing with analog signal, many cases sensor values are *oversampled*. But the oversampling has an impact on the actuator responding to the sensor. A bang-bang controller needs to smooth the response of the actuator. 7
 In a lift, there is a sensor attached to its door that should respond to any movement. However, the response of the door should be carefully designed. Comment of the design considerations of the door of a lift.
 b) Briefly describe the design principle of an accelerator and a gyroscope including their MEMS implementation. 10
 c) Describe the relations of modeling, design and analysis of embedded system development. 8

3. a) Describe the six degree of freedom of any locomotive. 7
 b) Explain the role of Newton's second law to derive the velocity and position from acceleration of the six degree of freedom. 10
 c) How does model-order reduction help simplifying the modeling? 8

4. a) Describe the edit-test-debug cycle of developing embedded applications. 5
 b) What is cross-compilation? 5
 c) Write a short note on (any three): 3×5
 - i. Micro controller
 - ii. DSP processor
 - iii. FIR Filter
 - iv. RISC vs. CISC processor
 - v. Processor Pipeline
 - vi. ISA vs. Embedded Processor

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
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Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION
DURATION: 1 Hour 30 Minutes

SUMMER SEMESTER, 2017-2018
FULL MARKS: 75

CSE 6491: Advanced Internet Computing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) Briefly discuss on various types of Internet Computing applications including the technologies you will use for the implementation. 10
 b) Briefly explain the structure of HTTP transactions with example. 10
 c) Can you run multiple TCP applications in a single server machine? Explain your answer. 5
2. a) What is XML? Mention different applications of XML. 5
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 b) Suppose you want to implement a distributed web application according to the architecture given in Figure 1. Redraw the architecture using appropriate links and labeling to different components and explain with a real life example. 10

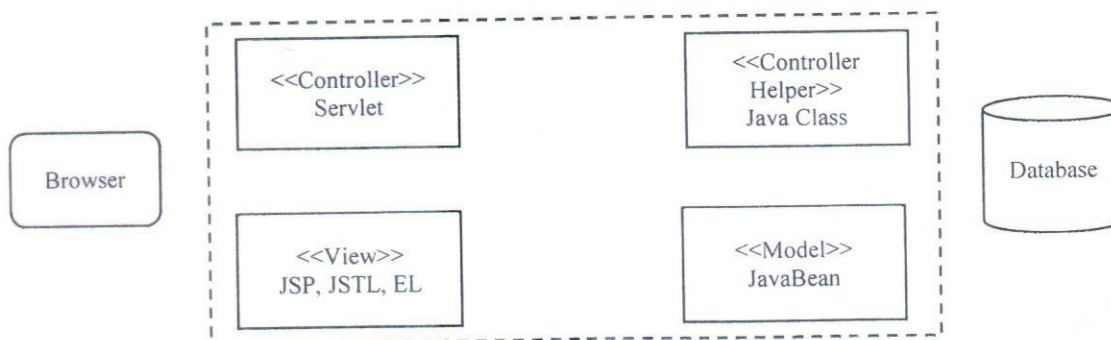


Figure 1: An Internet application architecture

- c) Suppose you have a HTML form as shown in Figure 2. Write a JSP page using JSP Expression Language (EL) to fetch 'student name' and 'roll number' using 'param' variable and display in a JSP page named 'display.jsp'.

7

```
<html>
<head>
  <title>Expression language example2</title>
</head>
<body>
<form action="display.jsp">
Student Name: <input type="text" name="stuname" /><br>
Student RollNum:<input type="text" name="rollno" /><br>
<input type="submit" value="Submit Details!!"/>
</form>
</body>
</html>
```

Figure 2: An HTML form