University of Asia Pacific

Department of Computer Science and Engineering

Program: B.Sc. in CSE

There are **Three** Questions. Answer all of them. Part marks are shown in the margins.

1. a. Explain how platform-independency is achieved in Java.   [4]   [CO1]

   b. Write a Java program that will take a student's grade (A, B, C, D, E, F) and convert it to the corresponding GPA according to the table below: [4]   [CO2]

Grade	A	B	C	D	E	F
GPA	4.0	3.5	3.0	2.5	2.0	0.0

2. a. Create a class named "Clock". Inside the class declare 3 instance variables; *hour, minute,* and *second.* Create a constructor that will take parameters for all 3 instance variables and initialize those variables. Create the following methods.   [5]   [CO3]

   i) public void addHours(int hr)
   - Inside the method, increase the *hour* attribute by *hr* amount. If the *hour* becomes greater than 23, subtract 24 from the *hour* value. Here *hr* is the parameter of the method.

   ii) public void addMinutes(int min)
   - Inside the method, increase the *minute* attribute by *min* amount. If the *minute* attribute becomes greater than 59, subtract 60 from the *minute* attribute, then call *addHours()* method and pass *min%60* as the parameter. Here *min* is the parameter of the method.

   iii) public void addSeconds(int **sec**)
   - Inside the method, increase the *second* attribute by *sec* amount. If the *second* becomes greater than 59, subtract 60 from the *second* attribute, then call *addMinutes* and pass *sec%60* as the parameter. Here *sec* is the parameter of the method.

   iv) public String getTime()

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- Return a string in the format *hour: minute: second* where *hour*, *minute*, and *second* are the attributes of the class.

b. Create a class named "TestClock" and add the main method to this class. Inside the main method, do the following: [3]   [CO3]

    i) Create an object of the **Clock** class you defined in Q2a and pass *hour*=11, *minute*=first 2 digits of your registration number, and *second* = last 2 digits of your registration number. Store the reference of this object to a variable named *myClock*.

    ii) Call *addSeconds(...)* using *myClock* variable and pass 100.

    iii) Call *getTime(...)* using *myClock* and print the output of this method call.
      - What is the output of this method call?

3. a. Carefully observe the code of the "Performer" class, **code segment**, and **output** of the code segment shown below. The 3 lines in the output are from the last 3 lines of the code. The "Singer" class in the **code segment** is the subclass of the "**Performer**" class. Write the "**Singer**" class in such a way that the code segment generates the given output.   [4]   [CO4]

Code of Class "Performer"

```java
package mid;
public class Performer {
        String name, field;

        public Performer(String name, String field) {
                this.name = name;
                this.field = field;
        }

        public void perform() {
                System.out.println("Performing...");
        }

        public void rehearse() {
                System.out.println("Practicing...");
        }

        @Override
        public String toString() {
                return String.format("name=%s, field=%s", name, field);
        }
}
```

Code Segment	Output of Code segment

`Singer sgr=new Singer("Habib","music","folk");`
 	
`sgr.perform();`
`sgr.rehearse();`
`System.out.println(sgr);`
	`Habib is singing folk song.`
	`Practicing...`
	`name=Habib, field=music`

University of Asia Pacific

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Mid-Semester Examination	Spring-2023	2nd year 1st Semester
Course Code: CSE 205	Course Title: Data Structures	Credit: 3.0
Time: 1.00 Hour.		Full Marks: 20

There are **Two** questions. Answer all of them. Part marks are shown in the margins.

1. a. Suppose you have a large sorted data set in an array. Which searching technique is better for finding a location of a particular data item from the array and explain why you think it as an efficient technique. **[3] [CO1]**

   b. In CSE 205 course we have a total of 40 students in each section. You already appeared in the first class test. Suppose in the class test everyone was present and got **unique** marks (No two students got the same mark). Student marks can range from zero to N (finite value). N does not have to be an integer. Your course teacher is interested in knowing the **average** of the **highest three marks** that the students obtained in efficient manner. You already know that, the algorithm which needs less amount of time is more efficient. To implement the task, s/he has created an array of size 40 and put marks in it randomly (Not organized in ascending/descending order). Write a necessary pseudocode/ algorithm and show simulations/ examples to implement the task. **[7] [CO2]**

   To simplify your task, you can disregard the student IDs for this implementation.

2. A web browser is an application for accessing websites. When a user requests a web page from a particular website, the browser retrieves its files from a web server and then displays the page on the user's screen. Browsers are used on a range of devices, including desktops, laptops, tablets, and smartphones. In 2022, an estimated 4.9 billion people have used a browser. The most used browser is Google Chrome, with a 65% global market share on all devices, followed by Safari with 18%. **[3 + 7] [CO1 CO2]**

   Now as a student of Computer Science and Engineering you are being asked to design a web browser -

   i. Explain which kind of data structure you will use for this purpose and why?
   ii. Show necessary operations on 5 browsing history with the above-mentioned data structure with necessary figures/ tables and iterations including the overflow and underflow conditions.

Mid-Semester Examination Spring-2023 2nd year 1st Semester

Course Code: EEE221 Course Title: Electrical & Electronic Engineering II Credit:4.0

Time: 1.00 Hour. Full Mark: 20

There are **Three** Questions. Answer all of them. Part marks are shown in the margins.

1. a. Construct the circuit for the logic function, $F = (\bar{A} + BC\bar{D})$ using DTL and TTL design techniques. [6] [CO3]

   b. Construct a 2-bit flash ADC and find out the digital code for the analog input voltage of 3.70V. [3] [CO3]

2. a. Develop a non-inverting amplifier that can amplify 3 times of the input signal. Show the input-output waveforms for your designed amplifier. Consider a 2V(peak-peak) sinusoidal as an input. [2] [CO3]

   b. Show the output waveform for the following circuit. Consider a sinusoidal wave as input (Vpeak = 6V) and Vref = - 3V. [2] [CO3]
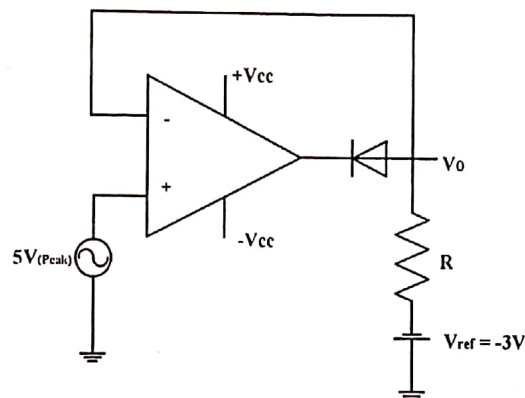
3. a. Explain the load characteristics of a shunt generator. You must include the load characteristic curve of the generator in your answer. [3] [CO2]

   b. A short shunt compound DC generator delivers a load current of 50A at 250V and has armature, shunt field and series field resistance of 0.45Ω, 500Ω and 0.03Ω respectively. Draw the equivalent circuit of the generator. Also calculate the generated voltage and the armature current. [4] [CO3]

University of Asia Pacific

Department of Basic Sciences and Humanities

Program: B.Sc. in CSE

Mid-Semester Examination   Spring-2023   2nd year 1st Semester

Course Code: MTH 201   Course Title: Math-III: Multivariable Calculus   Credit: 3.00

Time: 1.00 Hour.   Full Marks: 20

There are two questions. Answer all of them. Part marks are shown in the margins.

1. a. Define vector valued functions. Find the unit tangent vector and unit normal   [5]   [CO1]
vector for the helix $x = 2\cos t,\quad y = 2\sin t,\quad z = 4t$ at $t = \dfrac{\pi}{4}$. Also find the
parametric equations of tangent line to the curve whose parametric equations are
$x = t^3$, $y = t^4 - t^2$, $z = -5t^2$ at $t = 2$.

   b. Define arc length and hence find the arc length of the curve   [5]   [CO1]
   $\underline{r}(t) = e^t \cos t\,\underline{i} + e^t \sin t\,\underline{j} + e^t\,\underline{k}$ for $0 \le t \le \dfrac{\pi}{2}$.

2. a. Define curvature of a curve. Show that the curvature of a circle of radius a is $\dfrac{1}{a}$.   [5]   [CO2]

   b. What do you know about gradient, divergence and curl? Find the directional   [5]   [CO2]
   derivatives of $\phi = 4xz^3 - 3x^2y^2z$ at $(2, -1, 2)$ in the direction $2\mathbf{i} - 3\mathbf{j} + 6\mathbf{k}$.

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University of Asia Pacific
Department of Basic Sciences and Humanities
Program: B.Sc. in CSE

Mid-Semester Examination	Spring-2023	2nd year 1st Semester
Course Code: MTH 203	Course Title: Probability & Statistics	Credit: 3.00
Time: 1.00 Hour.		Full Marks: 20

There are three questions. Answer all of them. Part marks are shown in the margins.

1. a. The following table gives the frequency distribution of the total miles driven during 2009 by 300 car owners. **[3] [CO1]**

Miles Driven	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No. of Owners	7	26	59	71	62	39	22	14

Compute the mean of the frequency distribution.

   b. Calculate the median and mode age from the following data gives the distribution of browsing internet per week. **[4] [CO1]**

Age (years)of users	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Hours(per week)	3	7	16	12	9	5	3

2. For 50 airplanes that arrived late at an airport during a week, the time by which they were late was observed. In the following table, x denotes the time (in minutes) by which an airplane was late, and f denotes the number of airplanes: **[6] [CO2]**

X(Mins.)	0-20	20-40	40-60	60-80	80-100
f	14	18	9	5	4

Compute the standard deviation and hence find the variance by using empirical relations.

3. Calculate the regression equation of (i) y on x and (ii) x on y from the following data. (iii) estimate y when x = 15, (iv) estimate x when y = 10. **[7] [CO2]**

x:	1	3	4	6	8	9	11	14
y:	1	2	4	4	5	7	8	9