1. What is a structure? What are the differences between a structure and an array? Which would be a suitable choice if one decided:–
   a) To store the description of a book?
   b) To store the names of students in a course?

2. Determine whether the following statements are true or false.
   a) All members of struct must be of different types.
   b) A function cannot return a value of type struct.
   c) A member of a struct can be another struct.
   d) The only allowable operations on a struct are assignment and member selection.
   e) An array can be a member of a struct.
   f) In C++, some aggregate operations are allowed on a struct.
   g) Because a struct has a finite number of components, relational operations are allowed on a struct.

3. For the following code, identify the tag, the members and the structure variables:
   ```c
   struct resolutions{float odd21; float odds2; int odds3; }
   resolutions ika, jun;
   ```
   Then initialize the variables ika and jun to values of your choice.

4. Find the errors in the following structure declarations and program segments:
   a) ```c
   struct { int x; float y; }
   ```
   b) ```c
   struct Values{ string name; int age; }
   ```
   c) ```c
   struct TwoVals{int a, b;}
   main( ){ TwoVals.a=10; TwoVals.b=20; }
   ```
   d) ```c
   struct ThreeVals{ int a, b, c;
   void ThreeVals( )
    { a=1; b=2; c=3;  }
   }
   main( ){ ThreeVals vals; cout << vals <<endl; }
   ```

5. a) Define a structure consisting of two floating point members, called real and imaginary. Include the tag complex within the definition.
   b) Declare the variables x1, x2 and x3 to be structure of type complex, as described in part a).
   c) Combine the structure definition and the variable as described in part a) and b) into one declaration.
   d) Declare a variable x to be a structure variable of type complex, as described in part a).
   e) Assign the initial values 1.3 and -2.2 to the members x.real and x.imag, respectively.
f) Declare a pointer variable `px`, which points to a structure of type `complex`, as described in part a). Write expressions for the structure members in terms of the pointer variable.

6. Declare a structure that represents a student record, including the student’s name, age, address, id_number, GPA, current course load and courses taken.

7. Initialize the structure that has the members’ names and birthdays. Given a date, display the names of people who were born on this date.

8. a) Declare an enumerated structure that contains the days in a week.
   b) Declare an enumerated structure that contains the courses available in the faculty. Use short form.

9. Declare a union data structure that has its members an int, float and char.

**Programming Exercises**

1. Write a program using a data structure comprising club members’ names, post codes and telephone numbers. Input values for these members and display them by post codes.

2. Write a program using a data structure that holds the coordinate in the x-y form. Prompt the user to enter two points, and the program will print the distance and angle between the two points.

3. Write a program to display an increasing fractal number using a structure. For example, set the denominator to 10, and the display would be:-

   \[
   \frac{1}{10} \quad \frac{2}{10} \quad \ldots \quad \frac{10}{10}
   \]

4. Write a program that sum 10 integers stored in a data structure, using pointer syntax. The data must be initialized during the instantiation of the structure.

5. The equations \( x = r \cos \theta \), \( y = r \sin \theta \), \( r^2 = x^2 + y^2 \), and \( \tan \theta = \frac{y}{x} \) define the relationship between Cartesian coordinates \((x, y)\) and polar coordinates \((r, \theta)\). Write a program that prompts the user whether to convert from Cartesian coordinates to Polar coordinates or the other way round, then prompts for the coordinates and prints the converted coordinates. Represent points using structures.

6. Write a program that displays the resistor colour code and their respective weightage. Use an enumerated data structure with switch statement to do this. The user enters the code when requested, ie. Code 0 will display Black, Weightage 0.
7. Write a program that displays the television channels available in Malaysia. Use an enumerated data structure with switch statement to do this. The user enters the code when requested, ie. Code 1 will display RTM-TV1, Code 2 will display RTM-TV2.

PART A
1. A structure can hold _____ of different or of the same type.
2. A structure is like a class, but normally only contains member variables and no _____.
3. By default, all the members of a structure are ________.
4. Before a structure variable can be created, the structure must be ________.
5. When a structure variable is created, its members can be initialized with either a(n) __________ or a(n) __________.
6. The _____ operator is used to access structure members.

PART B
1. Declare a structure named TempScale, with the following members:
   - fahrenheit: a float
   - celsius: a float

   Next declare a structure named Reading, with the following members:
   - windSpeed: an int
   - humidity: a float
   - temperature: a TempScale structure variable

   Next define a Reading structure variable named today.
   Now write statements that will store the following data in the reading variable.
   - windSpeed: 37 mph
   - humidity: 33%
   - fahrenheit: 30 degrees
   - celsius: 0 degrees

2. Locate as many errors in this program segment.
   ```
   struct TwoVals{
      int a = 5;
      int b = 10;
   };
   main() {
      TwoVals v;
      cout << v.a << \\
      t" << v.b << endl;
   }
   ```