

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
1st Year Even Semester Examination 2019
COURSE NO: Phy 1213 COURSE TITLE: Physics
FULL MARKS: 72 TIME: 3 HRS

- N.B. (i) Answer any SIX questions taking any THREE from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION : A**Marks**

- Q.1. (a) What were the main results of Rutherford's alpha scattering experiment? How these results ruled out Thomson's atom model. 3
(b) Obtain a general expression for (i) the radius of Bohr orbit and (ii) the orbital frequency of electron occupying them. 6
(c) The ionization energy of H-like atom is 4 Rydberg. What is the wavelength of radiation emitted when the electron jumps from the first excited state to the ground state? $1 \text{ Rydberg} = 2.2 \times 10^{-10} \text{ J}$. 3
- Q.2. (a) Draw a curve showing stopping potential against frequency of a photo sensitive material. How do you determine Plank's constant with the help of the graph? 3
(b) A beam of monochromatic X-rays of wavelength λ is scattered by a light element. Obtain an expression for the wavelength of scattered radiation. 6
(c) Photon of energy 1.02 MeV undergoes Compton scattering through 180° . Calculate the energy of scattered photon. 3
- Q.3. (a) Define simple harmonic motion. Show that simple harmonic motion can be regarded as a projection of uniform circular motion on the diameter of a circle. 4
(b) What are Lissajous' figures? Discuss the formation of Lissajous' figures when the periods of the two vibrations are equal and the phase difference is 0 and $\pi/2$. 6
(c) A body is vibrating with simple harmonic motion of amplitude 13 cm and frequency 4 Hz. Compute the maximum values of the acceleration and velocity. 2
- Q.4. (a) Distinguish between phase velocity and group velocity and obtain a relation between the two. 5
(b) Show that for a plane progressive wave on the average half the energy is kinetic and half potential. 5
(c) A train approaches a stationary observer at a speed of 80 kilometers per hour sounding a whistle of frequency 1000 Hz. What will be the apparent frequency of the whistle to the observer? (velocity of sound = 332 m/s) 2

SECTION : B

- Q.5. (a) What is crystal? What are the lattice parameters of a unit cell? 2
(b) Calculate the effective number of lattice points of simple cubic and face centered cubic structure of crystal. 2
(c) Describe the seven systems of crystals along with their characteristics. 4
(d) Calculate the value of packing fraction for a b.c.c and f.c.c crystal structure. 4
- Q.6. (a) Explain the formation of a stable bond using the potential energy versus inter atomic distance curve. 5
(b) Explain the various types of bonding in crystals. Illustrate with example. 4
(c) Distinguish between a metal, semiconductor and insulator according to band theory. 3
- Q.7. (a) Explain with necessary diagram the theory of interference due to transmitted light. In this case why are the fringes less distinct? 5
(b) What do you understand by resolving power and dispersive power of grating? Prove that the dispersive power of the grating is directly proportional to the order of the spectrum. 4
(c) Light of wavelength λ is incident normally on a plane diffraction grating having N lines per unit length. How many orders of diffracted images can be observed? 3
- Q.8. (a) What is meant by plane polarized light, circularly polarized light and elliptically polarized light. How are they produced and detected? 6
(b) What is a quarter-wave plate? Deduce its thickness for a given wavelength in terms of its refractive indices. 4
(c) A 20 cm long tube containing sugar solution rotates the plane of polarization by 11° . If the specific rotation of sugar is 66.5° , calculate the strength of the solution. 2

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COURSE NO: Math 1213 COURSE TITLE: Co-Ordinate Geometry and Differential Equation
 FULL MARKS: 72 TIME: 3 HRS

- N.B. (i) Answer any SIX questions taking any THREE from each section.
 (ii) Figures in the right margin indicate full marks.
 (iii) Use separate answer script for each section.

SECTION : A

Marks

- Q.1. (a) What is transformation of co-ordinates? Prove that the value of $g_2 + f^2$ in the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ remains unaffected by orthogonal transformation without change of origin. 6
 (b) Transform the equation $17x^2 + 18xy - 7y^2 - 16x - 32y - 18 = 0$ to one in which there is no term in x , y and xy . 6
- Q.2. (a) Find the angle between the lines joining the origin to the point of intersection of $y = x + 1$, with $x^2 - 3y^2 + 2xy - 3x + 3y + 1 = 0$. 4
 (b) Find the lengths and equation of the axis of the conic $13x^2 - 18xy + 37y^2 + 2x + 14y - 2 = 0$. 8
- Q.3. (a) The direction cosines of two straight-lines are given by the relations $al + bm + cn = 0$ and $ul^2 + vm^2 + wn^2 = 0$. Find the conditions that the straight lines will be perpendicular and parallel. 6
 (b) Define direction cosine and direction ratio of a straight lines. Prove that if (l, m, n) are direction cosines of any line then, $l^2 + m^2 + n^2 = 1$. 6
- Q.4. (a) Find the equation of the plane which contains the line $\frac{x}{1} = \frac{y-3}{2} = \frac{z-5}{3}$, and which is perpendicular to the plane $2x + 7y + 3z = 1$ 6
 (b) Find the length and equations of the shortest distance (SD) between the two lines, $\frac{x+3}{-4} = \frac{y-5}{3} = \frac{z}{2}$ and $\frac{x+2}{-4} = \frac{y}{1} = \frac{z-7}{1}$ 6

SECTION : B

- Q.5. (a) A particle starting with velocity u moves in a straight line with a uniform acceleration f . Find the velocity and distance travelled in any time. 4
 (b) Find foci of the curve which satisfies the differential equation, $(1+y^2)dx - xdy = 0$ and pass through the point $(1, 0)$. 4
 (c) Show that $Ax^2 + By^2 = 1$, is the solution of $x \left\{ y \frac{d^2y}{dx^2} + \left(\frac{dy}{dx} \right)^2 \right\} = y \frac{dy}{dx}$ 4
- Q.6. (a) Solve the initial value problem, $(2x-5y)dx + (4x-y)dy = 0$, $y(1) = 4$ 6
 (b) Suppose $n \neq 0$ or 1 , then show that the transformation $v = y^{1-n}$ reduces the Bernoulli equation $\frac{dy}{dx} + p(x)y = Q(x)y^n$ to a linear equation in v . Solve $\frac{dy}{dx} + y = xy$. 6
- Q.7. (a) Find the solution of the initial-value problem $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 2e^x - 10\sin x$, $y(0) = 1$, $y'(1) = 2$. 6
 (b) Solve $(D^2 + 2D + 4)y = x^2 + e^x \sin 2x$. 6
- Q.8. (a) Solve $(2x+1)^2 \frac{d^2y}{dx^2} - 6(2x+1) \frac{dy}{dx} + 16y = 8(2x+1)^2$ 6
 (b) Find the differential equation for force free undamped motion. Then show that $x = C \cos \left(\sqrt{\frac{k}{m}} t + \phi \right)$ is the solution of this type of motion. Also find the period of the motion. 6

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1st Year Even Semester Examination 2019
COURSE NO: CSE 1201 COURSE TITLE: Data Structure
FULL MARKS: 72 TIME: 3 HRS

- N.B. (i) Answer any SIX questions taking any THREE from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

<u>SECTION : A</u>		Marks
Q.1.	(a) What is data structure? Describe three major operations playing vital role in data structure.	4
	(b) Explain time-space tradeoff with an appropriate example.	4
	(c) Draw a flow chart to insert an element ITEM into a linear array LA with N elements at K-th position.	4
Q.2.	(a) Suppose the following numbers are sorted in an array A: 45, 87, 15, 25, 19, 65, and 74. Describe every step to sort the array using- bubble sort algorithm and count the total number of comparisons required.	6
	(b) Let we have a (lower) triangular array A and we want to store nonzero entries of A in a linear array B as $B[L]=a_{JK}$, Find the relation among L, K and J.	3
	(c) Find the time complexity of binary search algorithm.	3
Q.3.	(a) What is meant by the "stack overflow" condition? Is it applicable to the linked list method of implementation of the stack? Give reason.	4
	(b) Design a data representation which sequentially map n objects into an array $a[1, n]$, n_1 of these data objects are stacks and the remaining n_2 , equal to $n-n_1$ are queue. Write an algorithm to add and delete elements from these objects.	6
	(c) The following sequence of operation is performed on a stack: push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop. Determine the sequences of popped out values.	2
Q.4.	(a) Show, with the help of an example, how the limitations of an array can be avoided by "linked list". What do you mean by linear list and generalized list?	4
	(b) Let A and B be two linked lists. Write an algorithm to create a new linked list C that contains elements alternately from A and B beginning with the first element of A. If you run out of elements in one of the lists, then append the remaining elements of the other list to C.	5
	(c) What is circular linked list? When does circular linked list is beneficial?	3

SECTION : B

- | | | |
|------|---|---|
| Q.5. | (a) Draw a flow chart to insert an ITEM into a queue representing by a linear array. | 4 |
| | (b) Write down the steps to add an ITEM with priority number N to a priority queue which is maintained in memory as a one-way linked list. | 4 |
| | (c) Consider the following deque of numbers where DEQUE is a circular array which is allocated six memory cells:
LEFT=2, RIGHT=4, DEQUE: <u> </u> , 10, 23, 34, <u> </u> , <u> </u> . | 4 |

Describe the deque while the following operations take place:

- (i) 14 is added to the right of the deque.
- (ii) Two number on the left are deleted.
- (iii) 20 is added to the left of the deque.
- (iv) One number on the right is deleted.

- Q.6. (a) Consider the following binary search tree which contains maximum 13 nodes. Draw a linked representation which uses three parallel arrays. 4

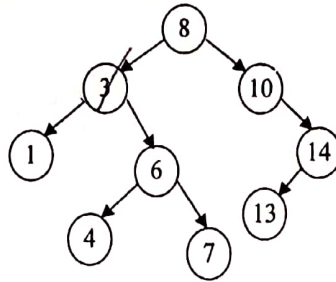


Fig 6(a)

- (b) Traverse this binary search tree according to pre-order, in-order and post-order technique. 4
- (c) Describe the each step of deletion a node from a binary search tree and delete the node of the above figure 6(a) which contains 3. 4
- Q.7. (a) Build a Huffman tree from the following frequencies table: 3

A	0.20
B	0.04
C	0.07
D	0.11
E	0.32
F	0.06
G	0.05
H	0.15

- (b) For the following binary tree answer the following: 5

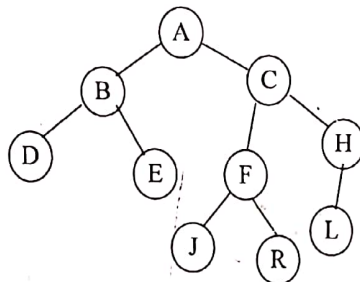


Fig 7(b)

- (i) What is the height of the tree?
- (ii) What are the ancestors and descendant of node C and H?
- (iii) What is the pre-order traversal?
- (iv) Degree of tree.
- (c) What is the difference between a heap and a binary search tree? 2
- (d) There are 8, 15, 13, 14 nodes in four different trees. Which of them could have formed a full binary tree? 2
- Q.8. (a) Show the different passes required to perform selection sort on the following set of numbers: 4
- 76, 32, 43, 10, 87, 21, 65, 54
- (b) What are the worst case and average complexity of the followings: 4
- (i) Insertion sort
- (ii) Selection sort
- (iii) Merge sort
- What are the benefits and limitations of merge sort?
- (c) What is meant by hashing and rehashing? How do you solve hash clashes by open addressing method. 4

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1st Year Even Semester Examination 2019
COURSE NO: CSE 1203 **COURSE TITLE: Object Oriented Programming**
FULL MARKS: 72 **TIME: 3 HRS**

- N.B. (i) Answer any SIX questions taking any THREE from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION : A

Marks

Q.1. (a) What is object oriented programming? Briefly explain the object oriented features provided by C++. 4

(b) Consider the following class

```
class student {
    private : int *roll;
             float *cgpa;
}
```

Now:

(i) What is constructor? Write appropriate parameterized constructor for the above class. 3

(ii) What is copy constructor? Write a copy constructor for the above class. 3

(iii) What is destructor? Write necessary destructor for the above class. 2

Q.2. (a) Demonstrate inline function with necessary C++ code. Explain how inline function can improve execution speed. 4

(b) Write down the difference between reference and pointer. 2

(c) Consider the following class and given main function. 6

```
class student {
    private : string roll;
             float cgpa;
    public : student(string r, float cg) {
        roll=r;
        cgpa=cg;
    }
    Void printf0 () {
        cout<<roll<< " " <<cgpa<<endl;
    }
}
```

// write additional codes if necessary

};

int main(){

 student *arr[10];

// write additional codes if necessary

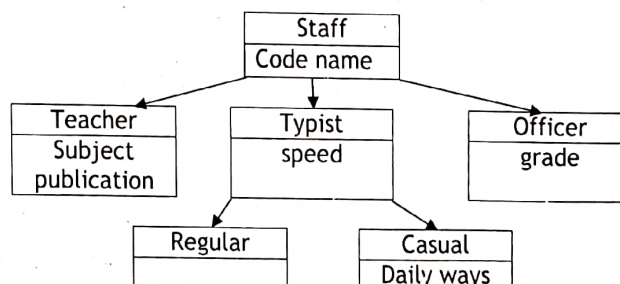
//-----

 return 0;

}

Now write necessary/additional C++ code so you can take ten (10) roll and cgpa as input from user and store them in the array arr[] given in the main function of the above code. Later sort this array in descending order and finally print the values of the sorted array arr[] using printf0() function.

Q.3. (a) An educational institution wishes to maintain a data of its employees. The hierarchical relationships of related classes are as shown in below figure. Define all the classes to represent above hierarchy and define functions to retrieve individual information as and when required. 6



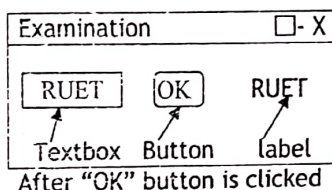
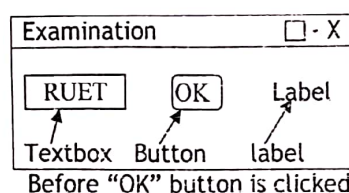
(b) What is operator overloading? State the rules for operator overloading. 4

(c) Define data abstraction with example. 2

- Q.4. (a) Answer the following: 4
- Define concept of virtual base class
 - Give reason for assigning protected visibility specifier to a class member.
- (b) State any four points of differentiation between compile time polymorphism and run time polymorphism. 4
- (c) Define a class named "Bank-Account" to represent the following members: 4
- Data members:
- Account Number
 - Name of Depositor
 - Account Type
 - Balance Amount
- Member functions
- Initialize members
 - Deposit amount
 - Withdraw amount
 - Display Balance
- Write a C++ program to test the Bank account class for 10 customers.

SECTION : B

- Q.5. (a) What are the differences between abstract class and interface? 4
- (b) Write a program in Java to illustrate the implementation of multiple inheritances through interfaces. 4
- (c) Write notes on: Packages, scanner classes and stream classes with example. 4
- Q.6. (a) What is abstraction in Java? With appropriate java code, explain how java interface can provide complete abstraction. 6
- (b) Why main method in Java is declared as public static? Explain briefly. 3
- (c) Demonstrate application of variable length argument with proper Java code. 3
- Q.7. (a) Consider the following Java class that is intended to represent a specific day in an eight-week University term. 9
- ```
public class TermDay {
 public int day; //The day of the week as a number 0-6
 public int week; //The week of the term as a number 0-7
};
```
- Create a class Encapsulated TermDay which applies the principles of data encapsulation as an alternative to TermDay. Your modified class should throw an exception if an invalid day of the week or week number is specified.
  - Create a class Immutable TermDay that is an immutable version of TermDay.
  - By applying one or more appropriate design patterns and adapting Immutable TermDay appropriately, show that how to ensure that only one Immutable TermDay object is ever created for a given day/week combination.
- (b) Explain method overriding with a suitable example program. 3
- Q.8. (a) Write down the difference among program, process and thread. 5
- (b) Write a Java code that has two threads where one thread is printing the output "RUET CSE" for 1000 times and the other thread is printing the output "18 SERIES" for 1000 times provided that "RUET CSE" is printed for 1000 times at first and only after that "18 SERIES" is printed for 1000 times. 4
- (c) Write necessary Java code in order to create the following graphical user interface while satisfying the conditions, 3
- Use flow layout
  - When "OK" button is pressed the input in the test field is shown in the label.
  - Define the default close operation for the interface.



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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**  
**1<sup>st</sup> Year Even Semester Examination 2019**

**COURSE NO: Hum 1213 COURSE TITLE: Economics, Government and Society**

**FULL MARKS: 72**

**TIME: 3 HRS**

- N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.  
(ii) Figures in the right margin indicate full marks.  
(iii) Use separate answer script for each section.

**SECTION : A**

**Marks**

- Q.1. (a) Define economics. 2  
(b) Distinguish between microeconomics and macroeconomics. 4  
(c) What is price elasticity? Suppose Herbs works about 22 days per month in a downtown San Francisco office tower. On the top floor of the building is a nice dining room. If lunch in the dining room were \$10, Herb eats there only twice a month. If the price of lunch falls to \$9, he would eat there 4 times a month. If lunch were only a dollar, he would eat there 20 times a month. Calculate the price elasticity? 6
- Q.2. (a) What is isoquant curve? 2  
(b) State the properties of isoquant curve graphically. 4  
(c) Briefly discuss the laws of returns to scale. 6
- Q.3. (a) Distinguish between short run cost function and long run cost function 3  
(b) Define TC, AC and MC. Find out the value of TVC, AVC, AFC, ATC and MC from the following table: 6

| q  | TC (\$) | TFC (\$) | TVC | AFC | AVC | ATC | MC |
|----|---------|----------|-----|-----|-----|-----|----|
| 0  | 100     | 100      | -   | -   | -   | -   | -  |
| 1  | 130     | 100      | -   | -   | -   | -   | -  |
| 2  | 150     | 100      | -   | -   | -   | -   | -  |
| 3  | 160     | 100      | -   | -   | -   | -   | -  |
| 4  | 170     | 100      | -   | -   | -   | -   | -  |
| 5  | 185     | 100      | -   | -   | -   | -   | -  |
| 6  | 210     | 100      | -   | -   | -   | -   | -  |
| 7  | 240     | 100      | -   | -   | -   | -   | -  |
| 8  | 280     | 100      | -   | -   | -   | -   | -  |
| 9  | 330     | 100      | -   | -   | -   | -   | -  |
| 10 | 390     | 100      | -   | -   | -   | -   | -  |

- (c) "The minimum point of the AC occurs to the right of the minimum point of Ave"- why? Explain. 3
- Q.4. (a) Define the fiscal policy and monetary policy. 3  
(b) What are international linkages? 3  
(c) "Aggregate supply and demand determine the major macroeconomic variables"- Explain the statement with flow diagram. 6

**SECTION : B**

- Q.5. (a) Why should we study sociology? 4  
(b) Define culture and civilization. 2  
(c) Write the concept and consequences of cultural diffusion and cultural conflict. 6
- Q.6. (a) What is social problem? 3  
(b) Narrate different forms of social problems. 3  
(c) Define cybercrime. 2  
(d) Discuss juvenile delinquency. 4
- Q.7. (a) What is public opinion? 4  
(b) Define human rights. 2  
(c) Shows the relationship between local government and central government. 6
- Q.8. (a) Point out your interventions to face the crises of your family. 5  
(b) Write a short note on "Blue Economy of Bangladesh." 5  
(c) Mention the merits and demerits of capitalism and socialism. 2

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