B. Sc (HONS.) IN CSE PART-II, THIRD SEMESTER EXAMINATION, 2020

COMPUTER SCIENCE AND ENGINEERING

[According to the New Syllabus]

Subject Code : 520203

(Object Oriented Programming)

Time—3 hours

Full marks—80

[N.B. The figures in the right margin indicate full marks. Answer any four questions.]

			Marks
1.	(a)	What do you mean by object oriented programming? How is it differ from procedure oriented programming.	6
	(b)	Define the following terms : *(i)* Inheritance *(ii)* Data abstraction *(iii)* Data encapsulation.	6
	(c)	"Encapsulation reduces complexity"—Justify your answer.	4
	(d)	Write a C++ program to evaluate the following function : Sum = $1 + \left(\frac{1}{2}\right)^2 + \left(\frac{1}{3}\right)^3 + \ldots\ldots\ldots\ldots + \left(\frac{1}{n}\right)^n$.	4
2.	(a)	What is friend function? Write down the advantages and disadvantages of using friend function.	1+4=5
	(b)	What is dynamic memory allocation? How can memory be allocated using new and release it using 'delete'?	5
	(c)	Define static data member. Mention the properties of static member functions.	1+4=5
	(d)	How can we access the class members? Explain with example.	5
3.	(a)	Explain function overloading and operator overloading with example.	6
	(b)	Which operators cannot be overloaded in C++ and why?	5
	(c)	Differentiate between public, private and protected inheritance with example.	6
	(d)	How can ambiguity problem be handled in multiple inheritance with example?	3

[Please turn over

			Marks
4.	(a)	What is a virtual function? Why do we need virtual functions?	5
	(b)	We know that a private member of a base class is not inheritable. Is it any way possible for the objects of a derived class to access the private members of the base class? If yes, how? Remember the base class cannot be modified.	6
	(c)	Briefly explain how try, catch and throw work together to provide C++ exception handling.	6
	(d)	What form of catch will handle all types of exceptions?	3
5.	(a)	What are the constructor and destructor functions? Write down the properties of those.	6
	(b)	What is polymorphism? How polymorphism is achieved at runtime?	4
	(c)	What is file mode? Describe various file modes in C++.	5
	(d)	Write a C++ program to copy the contents of one file to another.	5
6.	(a)	What is class path and byte code in Java?	3
	(b)	What is the difference between applet and servlet in Java?	4
	(c)	What is the task of the main method in a Java program?	4
	(d)	Explain 'public static void main (string args [ ])' in Java.	4
	(e)	Explain JDK, JRE and JVM.	5

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COMPUTER SCIENCE AND ENGINEERING

[According to the New Syllabus]

Subject Code : 520207

(Ordinary Differential Equation)

Time—3 hours

Full marks—80

[N.B. The figure in the right margin indicate full marks. Answer any **four** *questions.]*

Marks

1. (a) Define ODE, PDE and GS of a differential equation. Find the degree and order of the differential equation : 5

$$\sqrt[3]{\left(\frac{d^3y}{dx^3}\right)^4 - 5x\frac{d^2y}{dx^2} + y} = \sqrt[5]{\frac{dy}{dx} + y^2 - x}.$$

(b) Find the differential equation for the curve $y = Ae^{2x} + Be^{-2x}$, where A and B are arbitrary constants. 5

(c) Solve the following : 5×2=10

(i) Solve the initial value problem $y'' = 6x$ where $y(1) = 0$ and $y'(1) = 2$.

(ii) Solve the boundary value problem $x^2y'' + 4xy' + 2y = 0$, $y(1) = 1, y'(1) = 2$.

2. Solve any **four** of the following : 5×4=20

(i) $\sqrt{x+y+1}\ \frac{dy}{dx} = 1$

(ii) $\left(\frac{x+y-a}{x+y-b}\right)\frac{dy}{dx} = \frac{x+y+a}{x+y+b}$

(iii) $(x^2+y^2)\,dx - 2xy\,dy = 0$

(iv) $\frac{dy}{dx} = \frac{y}{x} + \tan\left(\frac{y}{x}\right)$

(v) $(x^3 + 3xy^2)\,dx + (y^3 + 3x^2y)\,dy = 0.$

3. Solve (any **four**) : 5×4=20

(i) $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 8y = 0$, where $x = 0, y = 0$ and $\frac{dy}{dx} = 8$

(ii) $\frac{d^2y}{dx^2} + 9y = x^2 + x + 1$

(iii) $(D^3 + 3D^2 + 3D + 1)\,y = e^{-x}$

(iv) $(D^3 - 9D^2 - D - 1)\,y = \cos 2x$

(v) $(D^2 - 2D)\,y = e^x \sin x.$

[Please turn over

Marks

4. (*a*) Solve the following initial value problems (any **two**) : 6×2=12

(*i*) $(D^2 + 4D + 8)\,y = 0, y(0) = 0$ and $y'(0) = 8$

(*ii*) $(D^2 + 6D + 9)\,y = 0,\ y(0) = 1$ and $y'(0) = 4$

(*iii*) $5y'' - 2y' + 3y = 0, y(0) = 2$ and $y'(0) = 6$.

(*b*) Use a suitable substitution to solve the ODE : 8

$$x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 3y = x^2 \log x\,.$$

5. (*a*) Solve the equation : 6

$$x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = x + \ln x.$$

(*b*) Solve the following equations by the method of variation of parameters : 7×2=14

(*i*) $y'' + 4y = 4\tan 2x$

(*ii*) $y'' + 4y' + 4 = (12x^2 - 6x)e^{2x}$ where $y(0) = 1,\ y'(0) = 0$.

6. (*a*) Use the variation of parameters method to solve the ODE : 13

$$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = x^2e^x.$$

(*b*) A spring with a mass of 2kg has natural length 0·5m. A force of 25·6N is required to maintain it stretched to a length of 0·7m. If the spring is stretched to a length of 0·7m and then released with initial velocity 0, find the position of mass at any time *t*. 7