B. Sc (HONS.) IN CSE, PART-I, FIRST SEMESTER EXAMINATION, 2019

[According to the New Syllabus]

CSE-510201

(Structured Programming Language)

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 is structured programming language? Write down the characteristics of structured programming language.	5
	(b)	Define algorithm and flow-chart. Describe the symbols used in flow-chart.	5
	(c)	What is pre-processor directive and header file? Give example.	5
	(d)	Write down the algorithm to calculate area and circumference of a circle.	5
2.	(a)	Define token, keyword, identifier, variable and constant.	5
	(b)	What is symbolic constant? Write down the rules for declaring symbolic constant.	5
	(c)	What are the different types of operator used in C language? Explain increment and decrement operator with example.	5
	(d)	Write a C program to determine the largest value from three numbers.	5
3.	(a)	Define loop and looping process. Explain entry controlled and exit controlled loops.	6
	(b)	What are the differences between while and do...............while loop?	3
	(c)	Write down the general form and flow-chart of the following statement :	6
		(i) else ....if ladder (ii) SWITCH (iii) FOR	
	(d)	Write a program in C to find the factorial of an integer.	5
4.	(a)	What is an array? Write the advantages and disadvantages of array.	1+4=5
	(b)	Mention some string handling functions and describe them with example.	5
	(c)	What is pointer? Write down the merits and demerits of using pointer with respect to array.	5
	(d)	Write a C program to multiply two matrices.	5

[Please turn over

5. (a) Define user-defined function and library function with example. 4

(b) What do you man by actual and formal parameter? Explain with an example. 5

(c) Define structure and union. Write down the differences between structure and array. 6

(d) Write a C program to calculate the sum of the following series : 5

$$1 + 2^2 + 3^3 + 4^4 + \ldots\ldots\ldots\ldots\ldots 50^{50}.$$

6. (a) What is file? Describe different file opening modes. 1+4=5

(b) What do you mean by dynamic memory allocation? What are the advantages of using linked list over array? 5

(c) Write down the differences between printf( ) and f printf ( ). 4

(d) Write a program to append the contents of one file to another file. 6

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B. Sc (HONS.) IN CSE, PART-I, FIRST SEMESTER EXAMINATION, 2019

[According to the New Syllabus]

CSE-510205

(Calculus)

Time—3 hours

Full marks—80

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

Group A—Differential Calculus

Marks

1. (a) Define domain and range with example.   4

   (b) Sketch the graph of the function :   8

   $$f(x) = |x - 1| + |x + 3|$$

   Also find the domain and range.

   (c) A function $f(x)$ defined as follows :   4

   $$f(x) = \begin{cases} 5x - 4 & \text{when} \quad 0 < x \le 1 \\ 4x^2 - 3x & \text{"} \quad\quad 1 < x < 2 \\ 3x + 4 & \text{"} \quad\quad x \ge 2 \end{cases}$$

   Test the continuity at $x = 1$ and $x = 2$.

   (d) By $(\sigma, \in)$ definition, prove that :   4

   $$\lim_{x \to 3} \frac{2x^2 - 18}{x - 3} = 12.$$

2. (a) Find $\frac{dy}{dx}$ (any **three**) : $4 \times 3 = 12$

   (i) $y = \tan^{-1}\left(\dfrac{1 + \tan x}{1 - \tan x}\right)$

   (ii) $y = x \cos^{-1} x + (\sin x) \ln x$

   (iii) $x + y = \sin^{-1}\left(\dfrac{y}{x}\right)$

   (iv) $x = a \cos^3 t, \ y = a \sin^3 t$

   (b) State Leibnitz's theorem. If $x = \sin\left(\dfrac{1}{m} \ln y\right)$ then show that— $2 + 6 = 8$

   $$(1 - x^2)y_{n+2} - (2n + 1)xy_{x+1} - (n^2 + m^2)y_n = 0.$$

[Please turn over

Marks

3. (a) State and prove Rolle's theorem. 6

(b) Evaluate : $\displaystyle \lim_{x \to 0} \frac{e^x - e^{-x} - 2x}{x - \sin x}$. 4

(c) Discuss the application of Rolle's theorem to the function $f(x) = x^2$ in $(-1, 1)$. 5

(d) A farmer with a field adjacent to a straight river wishes to fence off a rectangular area for grazing. If no fence is needed along the river and he has 2400m of fencing. What should be the dimensions of the field in order that it has a maximum area? 5

Group B—Integral Calculus

4. Evaluate (any five) : 4×5=20

(i) $\displaystyle \int \sin^5 x \cos^3 x \, dx$

(ii) $\displaystyle \int e^x \frac{(2 + \sin 2x)}{1 + \cos 2x} dx$

(iii) $\displaystyle \int \frac{7x - 9}{x^2 - 2x + 35}$

(iv) $\displaystyle \int \frac{dx}{\left(x^2 + 4x + 5\right)^2}$

(v) $\displaystyle \int \frac{dx}{5 + 4 \cos x}$

(vi) $\displaystyle \int \frac{e^{m \tan^{-1} x}}{1 + x^2} dx$

5. (a) Define gamma function. Prove that : 2+6=8

$$\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx = \frac{\Gamma\left(\dfrac{m+1}{2}\right) \Gamma\left(\dfrac{n+1}{2}\right)}{2\Gamma\left(\dfrac{m+n+2}{2}\right)}.$$

(b) Evaluate (any three) : 4×3=12

(i) $\displaystyle\int_{0}^{\frac{\pi}{2}} \frac{\sqrt{\sin x}\ dx}{\sqrt{\sin x} + \sqrt{\cos x}}$

(ii) $\displaystyle\int_{0}^{\infty} \frac{\left(\tan^{-1} x\right)^{2}}{1 + x^{2}}\ dx$

(iii) $\displaystyle\int_{0}^{\frac{\pi}{2}} \frac{dx}{1 + \cot x}$

(iv) $\displaystyle\int_{0}^{\frac{\pi}{2}} \sin^{6} x \cos^{3} x\ dx$

6. *(a)* Find the length of the arc of the parabola $y^2 = 16\,x$ between the vertex and one end of the latus rectum. 6

(b) Show that the area between the parabola $y^2 = 4x$ and the straight line $y = 2x - 4$ is 9. 7

(c) Find the volume of the solid generated by revolving the ellipse 7
$\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ about x-axis.

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B. Sc (HONS.) IN CSE, PART-I, FIRST SEMESTER EXAMINATION, 2019

[According to the New Syllabus]

CSE-510207

(Physics)

Time—3 hours

Full marks—80

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

Marks

1. (a) State and explain Coulomb's law. Write Coulomb's law in vector form. — 6

   (b) What is electric field and electric field strength? Explain how electric field is calculated. — 3+4=7

   (c) What is electric dipole and electric dipole moment? Calculate the E due to the charges of an electric field at a distance r along the perpendicular bisector of the line joining the charges. — 2+5=7

2. (a) State and explain Gauss's law. — 4

   (b) Derive Coulomb's law from Gauss's law. — 5

   (c) What is potential? Calculate the potential due to a point charge. — 1+5=6

   (d) Calculate the capacitance of a parallel plate capacitor. — 5

3. (a) Write down the comparisons among Dia, Para and Ferro-magnetism. — 5

   (b) What is self and mutual inductance? Define their co-efficients. — 5

   (c) Derive the expression for the rising current and define time-constant of an R-L circuit with DC voltage. — 6

   (d) A series R-L circuit has R = 100 KΩ and L = 10 mH. If a DC voltage source is connected to its circuits, determine the value of current as the % of the maximum current. — 4

4. (a) Define negative field vector and explain the concept of line of induction. What happens when a positive test charge +q moves through a uniform site of magnetic field with constant velocity? — 6

   (b) What is Lorentz force? Explain. — 4

   (c) Derive an expression for magnetic induction $\overline{B}$ at a distance 'r' from the center of a long cylindrical wire of radius R, where $r < R$. Assume the wire carries i_0 current distributed uniformly over the cross section of the wire. — 5

   (d) Two parallel conductors are 'd' distance apart. If both of them are of 'l' length and carries i_0 current, then find the nature and magnitude of force that exists between the two conductors. — 5

[Please turn over

5. (a) Mention and explain Biot-Savart's law.   4

   (b) What is capacitance? Find the equivalent capacitance when three 100μF capacitors are connected in series and then in parallel.   4

   (c) What is self inductance? Derive an expression of potential energy stored in magnetic field in a series RL circuit.   6

   (d) Explain the working principle of a moving coil galvanometer with required figure.   6

6. Write short notes on any **four** :   5×4=20

   (a) Co-efficient of magnetic coupling

   (b) Hysteresis and eddy-current loss

   (c) Resonance of series RLC circuit

   (d) Wattmeter

   (e) E. M. F.

   (f) Magnetic field of solenoid