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**B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017**

**Sixth Semester**

**Core Course—COMPUTATIONAL PHYSICS**

(Common for Model I B.Sc. Physics Model II B.Sc. Physics and  
Physics EEM)

[2013 Admission onwards]

Time : Three Hours

Maximum : 60 Marks

**Part A**

*Answer all questions.*

*Each question carries 1 mark.*

1. Explain the functions of the ALE and  $\overline{IO/\overline{M}}$  signals of the 8085 microprocessor.
2. What is an instruction register ? Why it cannot be accessed through any instruction ?
3. If flags are individual flip-flops, can they be observed on the oscilloscope ?
4. Distinguish between static RAM and dynamic RAM.
5. Name any decision making loops in C++.
6. Define the method of successive bisection.
7. What are the errors in integration formulae of Simpson's rule ?
8. Write an algorithm for second order Newton-Raphson method.

(8 × 1 = 8)

**Part B**

*Answer any six questions.*

*Each question carries 2 marks.*

9. What are the 3 types of communication lines (buses) in 8085 bus organisation ? Explain each.
10. Explain why a latch is used for an output port, but a tri-state buffer can be used for an input port.
11. Differentiate between assembly language and high level language.
12. Discuss on different types of storage devices.
13. What are objects ? Describe the syntax for defining objects with examples.
14. What are variables ? List C++ rules for variable naming.
15. Using Taylor series expansion obtain the Newton-Raphson formula. If a root is a repeated root then show that Newton-Raphson method converges to the root that the convergence is first order.

**Turn over**

16. Derive formula for approximating the function  $f(x)$  by fitting quadratics through sets of three points.
17. Solve the differential equation by using Runge-Kutta second order method :  
 $dy/dx = 2xy$   
 $y(0) = 0.5$ .  
 Solution for  $1 \geq x \geq 0$ .
18. Write a note on computer-oriented numerical methods.

(6 × 2 = 12)

**Part C**

*Answer any four questions.  
 Each question carries 4 marks.*

19. If the clock frequency is 5 MHz, how much time is required to execute an instruction of 18 T-states ?
20. Write a program using the AD1 instruction to add the two hexadecimal numbers 3AH and 48H and to display the answer at an output port.
21. Write a C++ program to prompt the user to input 3 integer values and print these values in forward and reversed order, as shown below :

Please enter your 3 numbers : 12 45 78

Your numbers forward :

12

45

78

Your numbers reversed :

78

45

12

22. Write C++ program to add two integers. Make a function add() to add integers and display sum in main() function.
23. Use Trapezoidal rule to obtain a formula to integrate the two variable function :

$$\int_c^d \int_a^b f(x, y) dx dy.$$

24. Solve the following differential equation using Euler's method :

$$y' = x + 2y$$

$$y(0) = 0$$

numerically, finding a value for the solution at  $x = 1$ , and using steps of size  $h = 0.25$ .

(4 × 4 = 16)

**Part D**

*Answer any two questions.  
Each question carries 12 marks.*

25. Discuss on 8085 bus organization. Also explain address bus, data bus, control bus.
26. Explain the various memory storage devices in computer.
27. Explain any *four* decision making loops using with proper syntax and proper program snippets.
28. The distance covered by a rocket in meters from  $t = 8s$  to  $t = 30 s$  is given by :

$$x = \int_8^{30} \left( 2000 \ln \left[ \frac{140000}{140000 - 2100t} \right] - 9.8t \right) dt$$

- (a) Use Simpson's 1/3 rule to find the approximate value of  $x$ .
- (b) Find the true error,  $E_t$ .
- (c) Find the absolute relative true error,  $\epsilon_t$ .

(2 × 12 = 24)