Professional Course Examination, November 2018

(3rd Semester)

BACHELOR OF COMPUTER APPLICATIONS

Course : BCA–302

[Mathematics—III (Numerical Analysis)]

(Revised)

Full Marks : 75

Time : 3 hours

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 15)

Tick (✓) the correct answer in the brackets provided :   1×10=10

1. The order of convergence in Newton-Raphson method is

(a) 2   (   )

(b) 4   (   )

(c) 3   (   )

(d) 0   (   )

2. In bisection method, the convergence is

(a) linear ( )

(b) quadratic ( )

(c) very slow ( )

(d) very fast ( )

3. The Newton-Raphson method fails when $f(x)$ is

(a) negative ( )

(b) zero ( )

(c) too large ( )

(d) Never fails ( )

4. A matrix a_{ij} 0 for i j is called _____ matrix.

(a) scalar ( )

(b) unit ( )

(c) diagonal ( )

(d) upper triangular ( )

5. The relationship between the operation E and D is

(a) D ( )

(b) ( )

(c) ( )

(d) E e^{hD} ( )

6. The degree of the differential equation

$$\frac{d^2y}{dx^2} = \sqrt{1 + \left(\frac{d^3y}{dx^3}\right)^2}$$

is

(a) 1   ( )

(b) 2   ( )

(c) 3   ( )

(d) 4   ( )

7. The polynomial $f(x)$ is called an algebraic equation if $f(x)$ is

(a) 0   ( )

(b) 1   ( )

(c) 3   ( )

(d) 2   ( )

8. If $y' = x + y, y(0) = 1$, then by Picard's method, the value of $y(1)$ is

(a) 0·915   ( )

(b) 0·905   ( )

(c) 1·091   ( )

(d) 2·013   ( )

9. The number of strips required in Simpson's 3/8th rule is multiple of

(a) 1   ( )

(b) 2   ( )

(c) 3   ( )

(d) 6   ( )

10. If $y' = -y$, $y(0) = 1$, then by Euler's method, the value of $y(1)$ is

    (a) 0·99   (   )

    (b) 0·999   (   )

    (c) 0·981   (   )

    (d) 0·813   (   )

Indicate whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark in the brackets provided :   1×5=5

  1. The order of the highest order derivative occurring in a differential equation is called degree of the differential equation.

                                                                 (T / F)

  2. The bisection method for finding the roots of an equation $f(x) = 0$ is

$$x_{n+1} = \frac{x_n + x_{n-1}}{2}$$

                                                                  (T / F)

  3. The formula of trapezoidal rule is

$$\int_{x_0}^{x_0+nh} f(x)\,dx = \frac{h}{2}[(y_0 + y_n) + 2(y_1 + y_2 + y_3 + \cdots + y_{n-1})]$$

                                                                  (T / F)

  4. $(1 + \triangle)(1 - \triangledown) = 0$

                                                                  (T / F)

  5. Extrapolation is defined as the process of estimating the value of a function outside the given range of values.

                                                                  (T / F)

SECTION—B

(*Marks* : 10)

Answer the following questions :   2×5=10

1. Write the formula for Gauss forward interpolation formula.

2. Show that ^{2} (   ).

3. To which form the coefficient matrix is transformed when AX B is solved by Gauss-Jordan method?

4. Prove that y $ax^3 bx^2$ c is the solution of $\dfrac{d^3 y}{dx^3}$ $6a$.

5. Write the formula for Newton's backward interpolation formula.

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Solve the system of equations x y z 9, $2x$ $3y$ $4z$ 13 and $3x$ $4y$ $5z$ 40 by using Gauss elimination method.   5

(b) Find a real root of x^3 $4x$ 9 0, correct to three decimal places, by using regula-falsi method.   5

OR

(c) Find the root of x^3 $2x$ 5 0, correct to three decimal places, by using Newton-Raphson method.   5

(d) Solve the system of equations $2x$ $3y$ z 9, x $2y$ $3z$ 6 and $3x$ y $2z$ 8 by using factorization method.   5

2. *(a)* Prove the following : 3+2=5

    (i) $\frac{1}{2}(\quad)$

    (ii) $-\quad-$

(b) Find the sum of the series

$$3 \quad 8 \quad 6 \quad 11 \quad 9 \quad 14 \quad \ldots \text{ to } n\text{-terms} \qquad 5$$

OR

(c) Evaluate $\int_0^1 \frac{\tan^{-1} x}{1 \quad x^2} \, dx.$

    5

(d) Express $y \quad 2x^3 \quad 3x^2 \quad 3x \quad 10$ in factorial notation. Find $^4 y.$ 5

3. *(a)* Find $f(0)$ and $f(0)$, given that

x	0	1	2	3	4	5
y	4	8	15	7	6	2

    5

(b) By using Romberg's method, evaluate $\int_0^1 \frac{dx}{1 \quad x}$ correct to three decimal places.   5

OR

(c) Evaluate $\int_0^1 \frac{dx}{1 \quad x}$ by using—

  (i) trapezoidal rule;

  (ii) Simpson's 1/3rd rule;

  (iii) Simpson's 3/8th rule;

  (iv) Weddle's rule.   5

(d) Evaluate $\int_0^1 \int_0^1 x e^y \, dx \, dy$ by using trapezoidal rule.   5

4. *(a)* Find the value of y at $x = 42$ by using Newton's forward interpolation formula, given that

x	20	25	30	35	40	45
y	354	332	291	260	231	204

5

(b) Find $f (1·22)$, using Gauss backward interpolation formula, given that

x	1	1·1	1·2	1·3	1·4
$f (x)$	0·841	0·891	0·932	0·963	0·985

5

OR

(c) Find the polynomial $f (x)$ by using Lagrange's method and hence find $f (6)$ for

x	0	1	2	5
$f (x)$	2	3	12	147

5

(d) Using Newton's divided formula, evaluate $f (8)$ for

x	4	5	7	10	11	13
$f (x)$	48	100	294	900	1210	2028

5

5. *(a)* Evaluate $y (0·2)$ such that $y' = 1 + 2xy$, $y (0) = 0$ by using Taylor's series. 5

(b) Using Runge-Kutta method, solve

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

with $y (0) = 1$ at $x = 0·2$. 5

OR

(c) Solve the following : 2+3+5=10

(i) $\dfrac{dy}{dx}\ e^{x}\ y$

(ii) $\dfrac{dy}{dx}\ \dfrac{x\ y}{x\ y}$

(iii) $(x^2\ 1)\dfrac{dy}{dx}\ 2xy\ \dfrac{2}{(x^2\ 1)}$

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Professional Course Examination, November 2018

(3rd Semester)

BACHELOR OF COMPUTER APPLICATIONS

Course : BCA–303

(Operating Systems)

(Revised)

Full Marks : 75

Time : 3 hours

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 15)

Tick (✓) the correct answer in the brackets provided : 1×10=10

1. Operating system does not interact with the computer directly. Each user prepares his job on an off-line device like punch cards and submits it to the computer operator. This is known as

(a) batch operating system ( )

(b) time-sharing operating system ( )

(c) distributed operating system ( )

(d) network operating system ( )

2. Which of the following is not an operating system service?

(a) Communication ( )

(b) Error detection ( )

(c) Program execution ( )

(d) System call ( )

3. The time it takes for the dispatcher to stop one process and start another running is known as

(a) scheduler ( )

(b) CPU utilization ( )

(c) context switch ( )

(d) dispatch latency ( )

4. Which of the following is not multithreading model?

(a) One-to-one ( )

(b) Many-to-one ( )

(c) One-to-many ( )

(d) Many-to-many ( )

5. Page fault occurs when

(a) the page is not in main memory ( )

(b) the page is in main memory ( )

(c) the page enters the block state ( )

(d) the process is in ready state ( )

6. Virtual memory is commonly implemented by

   (a) segmentation ( )

   (b) swapping ( )

   (c) demand paging ( )

   (d) page replacement ( )

7. A file is

   (a) single-level directory ( )

   (b) an abstract data type ( )

   (c) tree structure directory ( )

   (d) backup and restore ( )

8. There are no cycles in which type of directory?

   (a) General graph directory ( )

   (b) A cyclic graph directory ( )

   (c) One-level directory ( )

   (d) Two-level directory ( )

9. Resources are allocated to a process on non-sharable basic in

   (a) mutual exclusion ( )

   (b) hold and wait ( )

   (c) no preemption ( )

   (d) circular wait ( )

10. Which of the following is not system threat?

(a) Worm ( )

(b) Port scanning ( )

(c) Denial of service ( )

(d) User card ( )

Indicate whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark in the brackets provided : 1×5=5

1. A process is the fundamental unit of work in an operating system.

(T / F)

2. Thread is heavy weight.

(T / F)

3. Best fit allocates the first hole that is big enough.

(T / F)

4. Linked allocation solves all problems of contiguous allocation.

(T / F)

5. Viruses need other programs to spread.

(T / F)

(*Marks* : 10)

Answer the following questions :   2×5=10

1. What are the different operating systems?

2. Compare preemptive scheduling and non-preemptive scheduling.

3. What is translation lookaside buffer (TLB)?

4. What is access control list (ACL)?

5. Define Trojan Horse.

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* What is an operating system? What are the functions performed by it?

    3+3=6

    (b) Explain single user and batch system in detail.   4

OR

    (c) Explain the essential properties of the real time and clustered system of operating system.   4

    (d) Distinguish between multitasking and multiprogramming operating systems.   6

2. *(a)* What is a process? With the help of a state transition diagram, explain the various states of a process. 2+4=6

(b) Define throughput and turnaround time in a multiprogramming system. 4

OR

(c) Explain the round robin scheduling algorithm with a suitable example. 4

(d) Consider the following set of processes with a length of the CPU burst time given in milliseconds :

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	4
P4	1	5
P5	5	2

The processes have arrived in the order P1, P2, P3, P4 and P5, all at time 0.

(i) Draw Gantt charts illustrating the execution of this process using priority scheduling.

(ii) Calculate the average waiting time.

(iii) Calculate the average turnaround time. 6

3. *(a)* What is segmentation? Explain basic segmentation method. 7

(b) Determine the total swap time for a user process of size 10 MB with a disk transfer rate of 40 MB per second and latency time is 12 msec. 3

OR

(c) Explain process creation. 4

(d) Discuss demand paging in memory management. 6

4. *(a)* Briefly explain about single-level, two-level and tree structured directories. 10

<div align="center">OR</div>

(b) What is file protection? Explain the different types of access control. 10

5. *(a)* What is deadlock? What are the necessary conditions for a deadlock situation? 6

(b) Describe a resource allocation graph. 4

<div align="center">OR</div>

(c) Explain the safe and unsafe states for deadlock. 4

(d) Consider the following snapshot of a system :

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				

Answer the following questions using the Banker's algorithm :

(i) What is the content of the matrix Need?

(ii) Is the system in a safe state?

(iii) If a request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately? 6

<div align="center">★ ★ ★</div>

Professional Course Examination, November 2018

(3rd Semester)

BACHELOR OF COMPUTER APPLICATIONS

Course : BCA–303P

(Unix and Shell Programming)

(Practical)

(Revised)

Full Marks : 75

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer *any* **two** questions

1. Write a program to create five directories, list all the directories using the wild- card and remove the directory iteratively. 15

2. Write a program to calculate the sum of five-digit number. 15

3. Write a shell script which displays information about a given file in proper format. 15

SECTION—B

Answer *any* **one** question

4. Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of ₹ 15·00 per hour for every hour worked above 35 hours.   20

5. Write a shell script which displays a list of all files in the current directory to which you have read, write and execute permission.   20

SECTION—C

6. Viva voce.   15

7. Practical Record Book.   10

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Professional Course Examination, November 2018

(3rd Semester)

BACHELOR OF COMPUTER APPLICATIONS

Course : BCA–304

(Object-oriented Programming in C++)

(Revised)

Full Marks : 75

Time : 3 hours

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 15)

Tick (✔) the correct answer in the brackets provided :   1×10=10

1. How many access specifiers are present in C++?

(a) One (1)   (   )

(b) Two (2)   (   )

(c) Three (3)   (   )

(d) Four (4)   (   )

2. Which of the following header file includes definition of *cin* and *cout*?

(a) istream.h   (   )

(b) ostream.h   (   )

(c) iomanip.h   (   )

(d) iostream.h   (   )

3. Which of the following keywords is used to overload an operator?

(a) Operator   (   )

(b) Public   (   )

(c) Overload   (   )

(d) Friend   (   )

4. Which one of the following is not a valid reserved keyword in C++?

(a) Public   (   )

(b) Implicit   (   )

(c) Private   (   )

(d) Explicit   (   )

5. Which one of the following is not a type of constructor?

    (a) Copy constructor   (   )

    (b) Default constructor   (   )

    (c) Friend constructor   (   )

    (d) Parameterized constructor   (   )

6. Which one of the following symbols is used to create multiple inheritance?

    (a) Dot (.)   (   )

    (b) Comma (,)   (   )

    (c) Space ( )   (   )

    (d) Semicolon (;)   (   )

7. Which of the following STL containers stores the elements continuously (in adjacent memory locations)?

    (a) std::vector   (   )

    (b) std::list   (   )

    (c) std::map   (   )

    (d) std::set   (   )

8. Which of the following cannot be used with the keyword virtual?

(a) Class ( )

(b) Member function ( )

(c) Constructor ( )

(d) Destructor ( )

9. Which one of the following forms is correct in the throwing mechanism?

(a) Throw (exception) ( )

(b) Throw exception ( )

(c) Throw ( )

(d) All of the above ( )

10. A pointer pointing to a variable that is not initialized is called

(a) null pointer ( )

(b) void pointer ( )

(c) empty pointer ( )

(d) dangling pointer ( )

Indicate whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark in the brackets provided : 1×5=5

1. An array of objects is stored inside the memory in the same way as a multidimensional array.

(T / F)

2. Functions and operators overloading are examples of run-time polymorphism.

(T / F)

3. Overloaded operators can be overridden.

(T / F)

4. In multilevel inheritance, the constructors are executed in order of inheritance.

(T / F)

5. A virtual function cannot be a friend of another class.

(T / F)

SECTION—B

(*Marks* : 10)

Answer the following questions : 2×5=10

1. What is pure virtual function? Give an example.

2. What is type casting in C++? Give an example.

3. What is command-line argument?

4. What is exception? How is it handled in C++?

5. What is scope resolution operator?

1. *(a)* What is meant by data binding? Give example.   4

    (b) Explain the basic concepts of object-oriented programming.   6

OR

    (c) Describe the basic structure of C++ program.   4

    (d) Explain the following terms :   6

      (i) Data types in C++

      (ii) Control structures in C++

      (iii) Tokens and keywords

2. *(a)* What is function in C++? Explain about the call-by-reference with an example.   6

    (b) Explain the concept of inline function with an example.   4

OR

    (c) What is function overloading? Write a program to illustrate function overloading.   5

    (d) What is friend function? Explain with an example.   5

3. *(a)* Explain about the copy constructor with a suitable example.   6

    (b) Write the characteristics of constructor.   4

OR

    (c) Write a program to illustrate how the unary minus operator is overloaded.   6

    (d) What is operator overloading? Write the operators that cannot be overloaded in C++.   4

4. *(a)* Explain different types of inheritance. 4

(b) Write a program to illustrate the concept of multiple inheritance. 6

OR

(c) Write a program to illustrate the concept of virtual functions. 6

(d) Write a program to illustrate the use of ***this*** pointer. 4

5. *(a)* Explain the stream classes for console I/O operations. 5

(b) Explain about getline( ) and write( ) functions in C++. 5

OR

(c) Write a program to demonstrate the concept of rethrowing an exception. 5

(d) What is template? Explain the three key components of STL. 5

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Professional Course Examination, November 2018

(3rd Semester)

BACHELOR OF COMPUTER APPLICATIONS

Course : BCA–305

(Computer Organization and Architecture)

(Revised)

Full Marks : 75

Time : 3 hours

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 15)

Tick (✓) the correct answer in the brackets provided :   1×10=10

1. Which shift microoperation multiples a signed binary number by 2?

    (a) shl   (   )

    (b) shr   (   )

    (c) ashl   (   )

    (d) ashr   (   )

2. If R 1011, then R $\bar{\bar{R}}$ 1 is

   (a) 0100   (   )

   (b) 1100   (   )

   (c) 0110   (   )

   (d) 0101   (   )

3. Which of the following registers has 12 bits?

   (a) AR   (   )

   (b) IR   (   )

   (c) TR   (   )

   (d) INPR   (   )

4. Instruction to increment and skip if zero is

   (a) INC   (   )

   (b) SKI   (   )

   (c) ISZ   (   )

   (d) Both *(a)* and *(b)*   (   )

5. Stack organization employs

   (a) LIFO   (   )

   (b) FIFO   (   )

   (c) LILO   (   )

   (d) FILO   (   )

6. Which of the following is zero-address instruction?

   (a) MUL R1   (   )

   (b) ADD B   (   )

   (c) MOV R1, A   (   )

   (d) PUSH A   (   )

7. Command used to test various status conditions is

   (a) interrupt   (   )

   (b) I/O   (   )

   (c) control   (   )

   (d) status   (   )

8. The DMA transfers are performed by a control circuit called as

(a) device interface ( )

(b) DMA controller ( )

(c) data controller ( )

(d) overlooker ( )

9. The surrounding of the recently accessed block is called as

(a) neighbourhood ( )

(b) neighbour ( )

(c) locality of reference ( )

(d) None of the above ( )

10. The counter that keeps track of how many times a block is most likely used is

(a) count ( )

(b) reference counter ( )

(c) use counter ( )

(d) probable counter ( )

Indicate whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark in the brackets provided : 1×5=5

1. The high-impedance state behaves like an open circuit.

(T / F)

2. Hardwired control is faster than microprogrammed control.

(T / F)

3. RISC has variable length instruction format.

(T / F)

4. Interrupt is used to break the ongoing process of CPU.

(T / F)

5. The DMA doesn't make use of the MMU for bulk data transfers.

(T / F)

SECTION—B

(*Marks* : 10)

Answer the following questions : 2×5=10

1. Explain memory transfer.

2. What is accumulator (AC)?

3. Write a note on Program Counter.

4. What is DMA?

5. How is data stored in a magnetic disk?

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Design a common bus system for four registers using 4×1 multiplexers and explain how it works. — 6

   (b) What are the basic arithmetic microoperations? Describe the symbolic designation of microoperations. — 4

   OR

   (c) What is binary adder? Construct a circuit diagram for 4-bit binary adder-subtractor using full adder. — 5

   (d) What is a logic microoperation? Give a list of sixteen logic micro-operations with their corresponding Boolean functions. — 5

2. *(a)* What is computer register? List out registers for the basic computer and briefly explain their functions. — 5

   (b) What is a computer instruction? Briefly explain any eight basic computer instructions. — 5

   OR

   (c) Explain four phases of an instruction cycle. — 4

   (d) Briefly explain machine language, assembler and subroutines. — 6

3. *(a)* What are the major components of CPU? Explain how CPU bus system directs information flow to perform operation $R1 \leftarrow R2 + R3$. — 6

   (b) Write a note on stack organization. — 4

OR

(c) Describe any four addressing modes. 6

(d) What are the three basic types of data manipulation instructions? Give a list of shift instructions. 4

4. *(a)* What do you mean by interface? Explain the connection of I/O bus to input-output devices using diagram. 6

(b) Explain strobe and handshaking for asynchronous data transfer giving suitable diagram. 4

OR

(c) Discuss the three modes of transfer to and from peripherals. 6

(d) What is IOP? Write a block diagram of a computer with I/O processor. 4

5. *(a)* What do you mean by memory? Explain the hierarchy of memory giving diagrams. 4

(b) What is main memory? Explain the functions of RAM and ROM. 6

OR

(c) Write a note on virtual memory. 5

(d) What is cache memory? What are the three types of mapping procedure? 5

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