2018/EVEN/18/24/MCS-201/482

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UG Even Semester (CBCS) Exam., May—2018

COMPUTER SCIENCE

(2nd Semester)

Course No. : MCSCC-201

(Programming in C)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Pick up the correct alternative for each of the following questions : 1×2=2

   (i) Which of the following statements is wrong?

   (1) mes = 123·56;

   (2) con = 'T' * 'A';

   (3) this = 'T' * 20;

   (4) 3 + a = b;

(ii) A character variable can at a time store

(1) 1 character
(2) 8 characters
(3) 254 characters
(4) None of the above

(b) Two numbers are input through the keyboard into two locations C and D. Write a program to interchange the contents of C and D—

(i) without using third variable;

(ii) using third variable. 5

(c) If a four-digit number is input through the keyboard, write a program to obtain the sum of the first and last digit of this number. 5

(d) Write a program to check whether an integer is odd or even. 2

2. (a) The marks obtained by a student in 5 different subjects are input through the keyboard. The student gets a division as per the following rules :

Percentage above or equal to 60— First division

Percentage between 50 and 59— Second division

Percentage between 40 and 49— Third division

Percentage less than 40—Fail

Write a program to calculate the division obtained by the student—

(i) using nested if-else statement;

(ii) using if statement. 8

(b) Show working of for statement, while statement and do-while statement using flowchart and explain. 2+2+2=6

UNIT—II

3. (a) What is function? Why not squeeze the enter logic into one function main( )? Why write separate function? Give two reasons. 2+2=4

(b) What are a pointer and pointer to pointer? Explain with suitable example. 5

(c) When is the return statement mandatory in a function? 1

(d) Write a function to swap two numbers without using temporary variable. 4

4. (a) Write a function which receives a float and an int from main( ); find the product of these two returns. 5

(b) What is recursion? Write a recursive program to find the factorial of a number. 3

(c) Explain the differences between 'call by value' and 'call by reference' with one example for each case. 6

UNIT—III

5. What will be the output of the following programs? 4+4+6=14

(a)
```
main( )
{
  int n[25];
  n[0] = 100;
  n[24] = 200;
  printf("%d %d", *n, *(n+24) + *(n +0));
```

(b)
```
main( )
{
  static int a[ ] = {2, 4, 6, 8, 10};
  int i;
  for (i = 0; i ≤ 4; i ++)
  {
    *(a+i) = a[i] + i [a];
    printf("%d", *(i +a));
  }}
```


(c)
```
main( )
{
  static int n [3][3] = {2, 3, 4, 6,
                         8, 5, 3, 5, 1};
  int i, * ptr ;
  ptr = n;
  printf("%d", n[2]);
  printf("%d", ptr [2]);
  printf("%d", *(ptr + 2));
}
```

6. *(a)* Write a program to multiply two 2-D matrix. 5

(b) Write short notes on the following : 6

(i) Automatic storage class

(ii) External storage class

(c) Differentiate between the following : 3

(i) p and * p

(ii) * p++ and p++

UNIT—IV

7. *(a)* How is a structure different from an array and union? Give an example. 8

(b) Write a code to show one structure can be nested within an another structure. 6

8. (a) How do you declare a union? Give suitable example of a union and define structure with an example. 2+3=5

(b) Write a program to explain the concept of passing structure to a function. 6

(c) Explain self-referential structure. 3

UNIT—V

9. (a) Write a program to concatinate two files. 7

(b) Write a C program that counts the number of characters and number of lines in a file. 7

10. (a) What is command-line preprocessor? Explain with suitable example. 7

(b) Write a brief note on macros. 3

(c) Describe the various file operation functions. 4

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UG Even Semester (CBCS) Exam., May—2018

COMPUTER SCIENCE

(2nd Semester)

Course No. : MCSCC–202

(Statistical Methods and Applications)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. (a) The probability that a contractor will get a plumbing contract is 2/3, and the probability that he will not get an electric contract is 5/9. If the probability of getting at least one contract is 4/5, what is the probability that he will get both the contracts? 4

(b) A problem in statistics is given to three students A, B and C, whose chances of solving it are $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ respectively. Find the probability that the problem will be solved if they all try independently. 5

(c) Three groups of children contain respectively three girls and one boy; two girls and two boys; one girl and three boys. One child is selected at random from each group. Show that the chance that the three are selected consist of one girl and two boys is 13/32. 5

2. (a) State and prove Bayes' theorem for inverse probability. 6

(b) A restaurant serves two special dishes, A and B to its customers consisting of 60% men and 40% women. 80% of men order dish A and the rest B. 70% of women order B and the rest A. In what ratio of A to B should the restaurant prepare the two dishes? 5

(c) If events A and B are independent, then show that the following events are also independent : 3

(i) A and $\overline{B}$ are independent

(ii) $\overline{A}$ and $\overline{B}$ are independent

UNIT—II

3. (a) Let X be a continuous random variable with p.d.f

$$f(x)=\begin{cases} ax & 0\le x\le 1 \\ a & 1\le x\le 2 \\ -ax+3a & 2\le x\le 3 \\ 0 & \text{elsewhere}\end{cases}$$

(i) Determine the constant a.

(ii) Compute $P(X\le 1\cdot 5)$. 2+2=4

(b) The probability distribution of a random variable X is $f(x)=k\sin\frac{1}{5}\pi x,\ 0\le x\le 5.$

Determine the constant k and obtain the median and quartiles of the distribution. 6

(c) Calculate the standard deviation and mean deviation from mean if the frequency function $f(x)$ has the form

$$f(x)=\begin{cases} \dfrac{3+2x}{18} & \text{for} \quad 2\le x\le 4 \\ 0 & \text{otherwise}\end{cases}$$ 4

4. (a) Suppose that the life in hours of a certain part of radio tube is a continuous random variable X with p.d.f given by

$$f(x)=\begin{cases} \dfrac{100}{x^2} & \text{when } x\ge 100 \\ 0 & \text{elsewhere}\end{cases}$$

(i) What is the probability that all of three such tubes in a given radio set will have to be replaced during the first 150 hours of operation?

(ii) What is the probability that none of three of the original tubes will have to be replaced during the first 150 hours of operation?

(iii) What is the probability that a tube will last less than 200 hours if it is known that the tube is still functioning after 150 hours of service? 2+1+2=5

(b) The amount of bread (in hundred pounds) x, that a certain bakery is able to sell in a day is found to be a numerical valued random phenomenon, with a probability function specified by the p.d.f $f(x)$, given by

$$f(x) = \begin{cases} A \cdot x & 0 \le x < 5 \\ A(10 - x) & 5 \le x < 10 \\ 0 & \text{otherwise} \end{cases}$$

(i) Find the value of A such that $f(x)$ is a probability density function.

(ii) Find the probability that the number of pounds of bread that will be sold tomorrow is more than 500 pounds. 5

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(c) A continuous random variable X has the probability density function

$$f(x) = A + Bx, \; 0 \le x \le 1$$

If the mean of the distribution is $\frac{1}{2}$, find A and B. 4

UNIT—III

5. (a) The joint probability distribution of two random variables X and Y is given below :

$\rightarrow Y$ $\downarrow X$	1	2	3	4	*Total*
1	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	$\frac{10}{36}$
2	$\frac{1}{36}$	$\frac{3}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{9}{36}$
3	$\frac{5}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{8}{36}$
4	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	$\frac{5}{36}$	$\frac{9}{36}$
Total	$\frac{11}{36}$	$\frac{9}{36}$	$\frac{7}{36}$	$\frac{9}{36}$	1

Find conditional distribution of X, given the value of $Y = 1$ and that of Y, given the value of $X = 2$. 5

(b) A two-dimensional r.v. (X, Y) has a bivariate distribution given by

$$P(X = x, Y = y) = \frac{x^2 + y}{32}$$

for $x = 0, 1, 2, 3$ and $y = 0, 1$

Find the marginal distributions of X and Y. 4

(c) The joint probability density function of a two-dimensional random variable (X, Y) is given by

$$f(x, y) = \begin{cases} 2, & 0 < x < 1, \quad 0 < y < x \\ 0, & \text{otherwise} \end{cases}$$

(i) Find the marginal density functions of X and Y.

(ii) Find the conditional density function of Y, given $X = x$ and conditional density function of X, given $Y = y$. 5

6. *(a)* A box contains a white and b black balls. c balls are drawn at random. Find the expected value of the number of white balls drawn. 4

(b) A coin is tossed until a head appears. What is the expectation of the number of tosses required? 5

(c) Let the r.v. X have the distribution :

$P(X = 0) = P(X = 2) = p$ and $P(X = 1) = 1 - 2p$

where $0 \le p \le \frac{1}{2}$

For what p, the var(X) is maximum? 2

(d) Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them. 3

UNIT—IV

7. *(a)* A department has ten machines which may need adjustment from time to time during the day. Three of these machines are old, each having a probability of $1/11$ of needing adjustment during the day, and seven are new, having corresponding probabilities of $\frac{1}{21}$. Assuming that no machine needs adjustment twice on the same day, determine the probabilities that on a particular day—

(i) just two old and no new machines need adjustment;

(ii) if just two machines need adjustment they are of the same type. 5

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(b) The probability of a man hitting a target is ¼.

(i) If he fires seven times, what is the probability of his hitting the target at least twice?

(ii) How many times must he fire so that the probability of his hitting the target at least once is greater than 2/3? 5

(c) Six coins are tossed 6400 times. Using the Poisson distribution, find the approximate probability of getting six heads ten times. 4

8. *(a)* A manufacturer, who produces medicine bottles, finds that 0·1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Find how many boxes would one expect to contain—

(i) no defective bottle ;

(ii) at least two defective bottles. 3+3=6

(b) If X and Y are independent Poisson variates such that

$$P(X=1)=P(X=2) \text{ and } P(Y=2)=P(Y=3)$$

Find the variance of $X-2Y$. 4

(c) Ten coins are thrown simultaneously. Find the probability of getting at least seven heads. 4

Unit—V

9. *(a)* Show that the correlation coefficient is independent of change of origin and scale. 5

(b) Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y) : 5

X	:	65	66	67	67	68	69	70	72
Y	:	67	68	65	68	72	72	69	71

(c) The joint probability distribution of X and Y is given below :

$\to X$ $\downarrow Y$	-1	$+1$
0	$\frac{1}{8}$	$\frac{3}{8}$
1	$\frac{2}{8}$	$\frac{2}{8}$

Find the correlation coefficient between X and Y. 4

10. *(a)* Write down the different properties of regression coefficients. 4

(b) Obtain the equations of two lines of regression for the following data :

X	:	65	66	67	67	68	69	70	72
Y	:	67	68	65	68	72	72	69	71

Also obtain the estimate of X for Y = 70. 6

(c) Find the most likely price in Mumbai corresponding to the price of ₹ 70 at Kolkata from the following : 4

		Kolkata	Mumbai
Average price	:	65	67
Standard deviation	:	2·5	3·5

Correlation coefficient between the prices of commodities in the two cities is 0·8.

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2018

UG Even Semester (CBCS) Exam., May—2018

COMPUTER SCIENCE

(2nd Semester)

Course No. : MCSCC–203

(Computer Organization and Architectures)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Show the block diagram of the hardware that implements the following register transfer statements : 7

YT2 : R2 ← R1, R1 ← R2

(b) Briefly describe the functions of computer registers. 7

2. (a) Explain the operation of control processing unit for memory read instruction. Draw the timing diagram also. 7

(b) What is the difference between direct address instruction and indirect address instruction? How many references to memory are needed for each type of instructions to bring an operand into a processor register? 7

UNIT—II

3. (a) What is the difference between a microprocessor and a microprogram? Is it possible to design a microprocessor without a microprogram? Explain. 7

(b) With a block diagram, explain the working of a microprogrammed control unit. 7

4. (a) Convert the following arithmetic expressions from infix to reverse polish notation : 3+4=7

(i) $A*B+C*D+E*F$

(ii) $\dfrac{A*[B+C*(D+E)]}{F*(G+H)}$

(b) How many times does the control unit refer to memory when it fetches and executes an indirect addressing mode instruction if the instruction in a—

(i) computational type requiring an operand from memory;

(ii) branch type? 7

UNIT—III

5. (a) Draw the flowchart for addition of two floating-point numbers. 7

(b) Discuss, in detail, the Booth multiplication algorithm. 7

6. (a) Multiply two numbers given both the numbers are in 2's complement form. You may use Booth's algorithm for multiplication $-19 by +34$. 7

(b) Derive an algorithm in flowchart form for adding and subtracting two fixed point binary numbers when negative numbers are in signed -1's complement representation. 7

UNIT—IV

7. (a) State different addressing modes with examples. 7

(b) State and explain memory hierarchy. 7

8. (a) The logical address space in a computer system consists of 128 segments. Each segment can have up to 32 pages of 4 K words in each. Physical memory consists of 4K blocks of 4K words in each. Formulate the logical and physical address formats. 7

(b) (i) How many 128×8 RAM chips are needed to provide a memory capacity of 2048 bytes?

(ii) How many lines of the address bus must be used to access 2048 bytes of memory? How many of these lines will be common to all chips? 3+4=7

UNIT—V

9. (a) What is the difference between I/O mapped I/O and memory mapped I/O? What are the advantages and disadvantages of each? 7

(b) What programming steps are required to check when a source interrupts the computer while it is still being serviced by a previous interrupt request from the same source? 7

10. (a) What is the basic advantage of using interrupt-initiated data transfer over transfer under program control without an interrupt? 7

(b) Indicate whether the following constitute a control, status, or data transfer commands : 7

(i) Slip next instruction if flag is set

(ii) Seek a given record on a magnetic disk

(iii) Check it I/O device is ready

(iv) Move printer paper to beginning of next page

(v) Read interface status register

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2018/EVEN/18/24/MCS–204/485

2 0 1 8

UG Even Semester (CBCS) Exam., May—2018

COMPUTER SCIENCE

(2nd Semester)

Course No. : MCSCC–204

(Scientific Computation)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Perform the following floating-point operations : 4

   (i) 0·5635 E3 + 0·3267 E2

   (ii) 0·3467 E2 – 0·2358 E1

   (iii) 0·4936 E2 × 0·2468 E1

   (iv) 0·7323 E3 ÷ 0·1234 E–1

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2·5 10·5125

10·5 1·75 10·875 10·9375

(b) Use bisection method to find the roots correct to three places of decimal of the equation $x^3 - 4x - 9 = 0$ that lies between 2 and 3. 5

(c) Find the root of the equation $x^3 - 5x - 7 = 0$ that lies between 2 and 3 by secant method. 5

2. (a) What do you mean by approximation? Give example. 3

(b) Find the root of the equation $x^3 - 8x - 40 = 0$ that lies between 4 and 5 by using regula falsi method. 6

(c) Find the root correct to 3 places of decimal with Newton-Raphson method for equation $x - e^{-x} = 0$ (smallest positive root). 5

UNIT—II

3. (a) Derive Newton-Gregory forward interpolation polynomial. 7

(b) Use Lagrange's interpolation formula to find the value of y where $x = 2 \cdot 3$: 7

x	1	2	4	5	8
y	1·000	0·500	0·250	0·200	0·125

4. (a) Find the value of $f(0 \cdot 45)$ using Newton-Gregory forward interpolation for the following data : 7

x	0·4	0·5	0·6	0·7	0·8
$f(x)$	1·58	1·79	2·04	2·32	2·65

(b) Find the value of y at $x = 6$ and $x = 8$ from the following data, using Newton's divided difference formula : 7

x	3	7	9	10
y	168	120	72	63

UNIT—III

5. (a) Solve the following system of equations by Gauss elimination method : 6

$$5x_1 - x_2 + x_3 = 10$$
$$2x_1 + 4x_2 = 12$$
$$x_1 + x_2 + 5x_3 = -1$$

(b) What do you mean by partial and complete pivoting? 2

(c) Solve the following system of equation by Gauss-Jordan method : 6

$$5x_1 - x_2 = 9$$
$$-x_1 + 5x_2 - x_3 = 4$$
$$-x_2 + 5x_3 = -6$$

10
10
10
10
10

6. (a) Inverse the given matrix

$$\begin{bmatrix} 3 & -8 & 3 \\ 2 & -3 & 4 \\ 1 & -1 & 2 \end{bmatrix}$$

by using a numerical method. 7

(b) Fit a curve of the form $xy = a + bx^2$ to the following data by the method of least square : 7

x	1	2	4	6	8
y	5·43	6·28	10·32	14·86	19·51

UNIT—IV

7. (a) Find $f'(3\cdot5)$ and $f''(1\cdot5)$ of $y = f(x)$ from the given data : 7

x	1·5	2·0	2·5	3·0	3·5	4·0
y	3·375	7·0	13·625	24·0	38·875	59·0

(b) Deduce trapezoidal rule. 4

(c) Compute

$$\int_4^{5\cdot2} \log_e x\,dx$$

using Simpson 3/8th rule with $h = 0\cdot2$. 3

8. (a) Find $f'(40)$ and $f''(55)$ from the given data : 6

x	35	40	45	50	55
y	0·7002	0·8391	1·0000	1·1918	1·4281

(b) Evaluate

$$y = \int_0^1 \frac{dx}{\sqrt{x^4 + 1}}$$

using trapezoidal and Simpson's 1/3rd rule with $h = 1/2$ and $1/4$. 4+4=8

UNIT—V

9. (a) Using Taylor series method of 4th order, find y at $x = 1\cdot1$ and $1\cdot2$ by solving $\frac{dy}{dx} = x^2 + y^2$, $y(1) = 2$. 6

(b) Use Runge-Kutta method to find $y(0\cdot2)$ and $y(0\cdot4)$ taking $h = 0\cdot2$, given that

$$\frac{dy}{dx} = y^2 - xy, \quad y(0) = 2$$ 8

10. (a) Given that $\frac{dy}{dx} = x^2 + y + 4$. Compute $y(0\cdot05)$ using Euler's method and $y(0\cdot1)$ using Euler's modified method with $h = 0\cdot05$. 6

(b) Given that $\frac{dy}{dx} = \frac{1}{2}(1 + x^2)y^2$; $y(0) = 1$; $y(0 \cdot 1) = 1 \cdot 06$; $y(0 \cdot 2) = 1 \cdot 12$ and $y(0 \cdot 3) = 1 \cdot 21$. Evaluate $y(0 \cdot 4)$ by Milne's predictor-corrector method. 8

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