D 93665

(Pages : 3)

Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, NOVEMBER 2020

EN 19 301—ENGINEERING MATHEMATICS – III

Time : Three Hours

Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 marks.

1. Let $H = \left\{(a+3b, a-b, 2a-b, 4b)^T : a,b \in R\right\}$. Show that H is a subspace of R^4.

2. Prove that $(1,3,4,2), (3,-5,2,2)$ and $(2,-1,3,2)$ in R^4 are linearly dependent over R.

3. Find the orthogonal complement of the plane spanned by the vectors $(1,1,2)$ and $(1,2,3)$.

4. Find the Fourier transform of :

$$f(x) = \begin{cases} e^{2ix}, -1 < x < 1 \\ 0 \quad , \text{otherwise.} \end{cases}$$

5. Find the Fourier cosine transform of :

$$f(x) = \begin{cases} \sin x \text{ in } 0 < x < \pi \\ 0 \qquad \text{otherwise.} \end{cases}$$

6. Find the Fourier sine transform of :

$$f(x) = \begin{cases} x^2 \quad \text{if } 0 < x < 1 \\ 0 \qquad \text{if } x > 1. \end{cases}$$

7. Find the Laplace transform of $te^{-t}\cos 2t$.

8. Find the inverse Laplace transform of $\dfrac{2}{s^2 + \dfrac{s}{3}}$.

9. Find $L^{-1}\left(\log\left(\dfrac{s+a}{s-b}\right)\right)$.

Turn over

10. Prove that $J_{-n}(x) = (-1)^n J_n(x)$ where n is a positive integer.

11. Prove that $xJ_n' - nJ_n + xJ_{n-1}$.

12. Show that $\frac{d}{dx}\left(x^{-n} J_n(x)\right) = -x^{-n} J_{n+1}(x)$.

13. Solve $z^2\left(p^2 + q^2 + 1\right) = c^2$.

14. Solve the pde $p^2 y\left(1 + x^2\right) = qx^2$.

15. Solve the pde $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$.

(10 × 5 = 50 marks)

Part B

Answer **one** *full section of each questions.*
Each question carries 10 *marks.*

16. (a) Show that $\mathcal{B}_1 = \{(1,1,1), (0,2,3), (0,2,-1)\}$ and $\mathcal{B}_2 = \{(1,1,0), (1,-1,0), (0,0,1)\}$ are two bases of R^3. Find the co-ordinate vector of $v = (3,5,-2)$ relative to $\mathcal{B}_1$ and $\mathcal{B}_2$.

Or

(b) Find an orthonormal basis for R^3 from $(1,0,1), (1,0,0), (2,1,0)$ by Gram–Schmidt process.

17. (a) Find the Fourier sine and cosine integral representation of $f(x) = \begin{cases} 1 - x^2, 0 < x < 1 \\ 0 \quad , \quad x > 1. \end{cases}$

Or

(b) Using Fourier integral representation show that :

$$\int_0^\infty \frac{\cos wx + w \sin wx}{1 + w^2}\, dw = \begin{cases} 0 & \text{if } x < 0 \\ \frac{\pi}{2} & \text{if } x = 0 \\ \pi e^{-x} & \text{if } x > 0. \end{cases}$$

18. (a) Solve $y'' - 3y' + 2y = 4t - 8, y(0) = 2, y'(0) = 7$.

Or

(b) Find Laplace transform of :

(i) $\frac{\cos 2t - \cos 3t}{t}$.

(ii) $t^2 \cos(3t - 5)$.

19. (a) Solve in series the equation $\frac{d^2y}{dx^2} + x^2 y = 0$ by Frobenius method.

Or

(b) Solve in series the equation :

$$2x^2 \frac{d^2y}{dx^2} + (2x^2 - x)\frac{dy}{dx} + y = 0.$$

20. (a) Derive the one dimensional heat equation.

Or

(b) Solve the one dimensional wave equation by the method of separation of variables.

(5 × 10 = 50 marks)

D 93665-A **(Pages : 3)** **Name.....**

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

EN 19 302—DISCRETE COMPUTATIONAL STRUCTURE

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. State the properties of Binary Operations.
2. How many rows are needed in the truth table of given statement :

   a) $p \urcorner p$; and b) $\left(p \wedge \urcorner r\right)$.

3. Prove $\left[(A \to B) \wedge A\right] \to B \left[(A \to B) \wedge A\right] \to B$ is a tautology.
4. Explain Quantifiers and its types
5. Show $(Z+,/)$ is a POSET.
6. Write an order of an element. Give example.
7. Prove that $\left(\urcorner p \wedge p\right) \wedge q$ is a contradiction.
8. Obtain PCNF of $P \to \left(P \wedge (Q \to P)\right)$.
9. $1.2^0 + 2.2^1 + 3.2^2 + \ldots\ldots\ldots\ldots n.2^{\eta - 1} = (n-1)\,2^{\eta} + 1$ for all positive integers.
10. Every cyclic group is Abelian. Explain.
11. Prove that every element of Sn $(n > 1)$ can be written as a product of elements of the form (1k).
12. Any right cosets of H in G are eithe disjoint or identical. Justify.
13. Show that monoid homomorphism preserves the property of invertability.

Turn over

14 Define Subgroup. Give Example.

15 Explain the ring with zero and without zero divisor.

(10 × 5 = 50 marks)

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. a) i) Using Indirect method, prove that $P \to R, Q \to S, P \vee Q \Rightarrow S \vee R$.

ii) What is the direct proof of the above ? Illustrate.

Or

b) $(\neg p \to R) \wedge (Q \leftrightarrow P)$. Obtain PCNF and PDNF. Show by using Laws of Propositions.

17. a) Let be given finite set and P (A) its power set. Let $\leq$ be the inclusion relation on the elements of $P(A)$. Draw hasse diagram of $(P(A), \leq)$ for :

(a) $A = \{a\}$; (b) $A = \{a\}$; and (c) $A = \{a, b, c\}$.

Or

b) Draw Hasse diagram for $(D\,12, /)$.

18. a) State and explain Lagrange's Theorem.

Or

b) i) Let $G = (1, -1, i, -i)$ is a group under multiplication and $H = (1, -1)$ is a subgroup of G. Give left coset.

(5 marks)

ii) If G is a finite group of order n, then $a^n = e$ for any a £ G. (5 marks)

19. a) What is necessary and sufficient conditions of subgroup ?

Or

b) Let (G, A) and (G', 0) be two groups. Let $f : G \to G'$ be a homomorphism of groups with kernel K. Then G/K is isomorphic to $f(G) \leq G'$.

20. a) Prove that the set $Z_4 = (0, 1, 2, 3, 4)$ is a commutative ring with respect to the binary operation t_4 and X_4.

Or

b) i) The Kernels of Homomorphism from a group of $(G, *)$ to $(G', *)$ is a subgroup of G. Justify. (5 marks)

ii) State Cayley's Theorem. (5 marks)

[5 × 10 = 50 marks]

Prove th group is Abel: $= (n-1)2^n$

D 93675 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

Information Technology

IT 19 303—PROGRAMMING IN C

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. List and explain the types of header files in C.
2. What is the significance of an algorithm and a flowchart ?
3. Why C is called structured language ? Explain.
4. Write a C program to find the sum of two matrices of order 2*2.
5. List the applications of arrays.
6. What is a function ? Explain with an example.
7. Explain Bit Fields.
8. What is the difference between Union and Structure ?
9. How is a Union declared ? Show with an example.
10. Explain the use of the malloc() function.
11. When is the dereferencing operator used ? Give example.
12. What is the use of Dot (.) Operator ? Explain with an example program.
13. Discuss in brief dynamic memory allocation.
14. What is the use of realloc() ?
15. What is the purpose of free() ?

(10 × 5 = 50 marks)

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. a) Write a C program with algorithm and flowchart for converting the temperature from Celsius to Fahrenheit.

Or

b) Write a C program to find the greatest among three numbers using if- else and if - else - if.

Turn over

17. a) Define jagged array. Write a program to implement jagged array.

Or

b) State the advantages of a function. How you will declare and call a function ? Show with an example.

18. a) Write a C program to pass structure as a arguments.

Or

b) Write a C program to define pointer to structure.

19. a) Explain pointer arithmetic with example program.

Or

b) Explain arrays of pointers with example program.

20. a) Explain the various operations for file handling.

Or

b) Write a simple C program to illustrate the modes in which a file can be opened.

(5 × 10 = 50 marks)

D 93676

(Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

Information Technology

IT 19 304—COMPUTER ORGANIZATION AND DESIGN

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carriers 5 *marks.*

1. Explain the functional units of a computer.
2. What is the purpose of Instruction Register (IR), Memory Address Register (MAR) and Memory Data Register (MDR) ?
3. Define a bus. Explain its types in brief.
4. (a) Perform the arithmetic operations (+42) + (–13) and (–42) – (–13) in binary using the signed-2's-complement representation for negative numbers.

   (b) Perform subtraction with the following unsigned decimal numbers by taking the 10's complement of the subtrahend.

   (i) 5250 – 1321 ; and (ii) 1753 – 8640.
5. Discuss the Instruction Set Architecture.
6. Explain the memory hierarchy in brief.
7. Differentiate static RAM and dynamic RAM.
8. Write short notes on (i) PROM ; and (ii) EPROM.
9. Explain the significance of floating-point representations.
10. Explain the concept of the virtual memory and its types.
11. Discuss the features and significance of magnetic disks.
12. Explain the arithmetic and logic unit with neat block diagram.
13. Define hazards and explain the types of hazards.

Turn over

14. Briefly explain the importance of a pipeline process.

15. Describe bus arbitration.

(10 × 5 = 50 marks)

Part B

Answer **one** *full section from each question.*

Each question carries 10 *marks.*

16. (a) What is Addressing Mode ? Explain in detail the different types of addressing modes.

Or

(b) Give examples for zero-address, one-address, two-address, and three-address instructions and illustrate the concept.

17. (a) With a neat diagram explain the booths algorithm.

Or

(b) (i) Differentiate between CISC scalar processor and RISC scalar processor. (5 marks)

(ii) Write short notes on cache memory organization. (5 marks)

18. (a) Give the structure of semiconductor RAM memories. Explain read and write operations in detail.

Or

(b) Compare paging and segmentation mechanism for implementing virtual memory.

19. (a) Explain in detail the basic types of shift registers.

Or

(b) What is Direct Memory Access (DMA) ? List the various DMA channels. Explain DMA controller with a neat sketch.

20. (a) Explain in detail about interrupt handling.

Or

(b) Write short notes on magnetic tape and optical drivers. Explain their functionalities.

(5 × 10 = 50 marks)

D 93677 (Pages : 3) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

Information Technology

IT 19 305—SWITCHING THEORY AND LOGIC DESIGN

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. i) Convert $(136)_8$ to base 2 and base 16.

   ii) Convert $(110101)_2$ to base 8 and 16.

2. i) Add the binary numbers 00111 and 10101 and show the equivalent decimal addition.

   ii) Subtract the binary number 00111 from 10101 and show the equivalent decimal subtraction.

3. i) Multiply $(10010)_2$ and $(11001)_2$.

   ii) Add $(110100111)_2$ and $(1110101)_2$.

4. i) Simplify the expression F = x'yz + x'yz' + xz.

   ii) Prove the expression x'y'z' + x'yz' + xyz' = x'z' + yz'.

5. i) Simplify the Boolean function $f1(x, y, z) = \sum m(2, 3, 5, 7)$.

   ii) Define fan in, fan out and propagation delay.

6. Simplify the Boolean expression using k-map

   F = A'C + A'B + AB'C + BC

7. How will you convert a 4-bit binary to gray code ?

8. Construct 16*1 multiplexer with two 8*1 and 2*1 multiplexer.

9. Implement the following Boolean function using 4 : 1 multiplexer, $F(A, B, C) = \sum m(1, 3, 5, 6)$.

Turn over

10. Construct a JK flip-flop using a D Flip-flop, a 2-to-1 line multiplexer and an inverter.

11. Design a sequential circuit with two D Flip-Flops, A and B, and one input x.

When $x = 0$, then the state of the c ircuit remains the same. When $x = 1$, the circuit goes through the state transitions from 00 to 01 to 11 to 10 back to 00, and repeats

12. Explain the working procedure of serial-in serial-out shift register.

13. Explain in detail about RAM and its types.

14. Implement the following two Boolean functions with a PLA :

$$F1(A, B, C) = \sum (0, 1, 2, 4)$$
$$F2(A, B, C) = \sum (0, 5, 6, 7)$$

15. What is memory unit and memory deciding ?

(10 × 5 = 50 marks)

Part B

Answer **one** *full section from each question.*
Each question carriers 10 *marks.*

16. (a) Perform the following operations :

(i) Add $(4712)_8$ and $(1624)_8$. (2 marks)

(ii) Subtract $(232)_8$ from $(417)_8$. (2 marks)

(iii) Perform hexadecimal addition of $(B49C)_{16}$ and $(4E2F)_{16}$. (2 marks)

(iv) Perform hexadecimal subtraction of $(C92D)_{16}$ from $(7F9E)_{16}$. (2 marks)

(v) Convert the binary number 0.011_2 to its decimal equivalent. (2 marks)

Or

(b) Perform the following operations :

(i) Convert the binary number 110.011 to its decimal equivalent. (2 marks)

(ii) Convert the decimal fraction 0.432 to octal equivalent. (2 marks)

(iii) Convert $58.75 \div 23.5$ to binary form and then perform division operation. (2 marks)

(iv) Divide the following binary number $11001.11 \div 1101$. (2 marks)

(v) Add binary numbers $10011.1_2 + 11011.01_2$. (2 marks)

17. (a) Simplify the following expression to sum of product using Tabulation Method $f(a, b, c, d) = \sum (0, 1, 2, 3, 4, 6, 7, 11, 12, 15)$.

Or

(b) Simplify the Boolean expression using *k*-map F = A'C + A'B + AB'C + BC.

18. (a) Design a full subtractor and derive expression for difference and borrow. Realize using two half subtractor.

Or

(b) How to design a 2 bit magnitude comparator with 3 outputs A > B, A = B, A.

19. (a) A sequential circuit with two D Flip-Flops, A and B ; two inputs, x and y ; and one output, z, is specified by the following next-state and output equations :

$$A(t+1) = x'y + xA$$
$$B(t+1) = x'B + xA$$
$$z = B$$

(i) Draw the logic diagram of the circuit. (3 marks)

(ii) List the state table for the sequential circuit. (3 marks)

(iii) Draw the corresponding state diagram (4 marks)

Or

(b) Summarize the characteristic table and equation of JK flip flop.

20. (a) Implement the following two Boolean functions with a PAL.

$$w(A, B, C, D) = \sum (2, 12, 13)$$
$$x(A, B, C, D) = \sum (7, 8, 9, 10, 11, 12, 13, 14, 15)$$
$$y(A, B, C, D) = \sum (0, 2, 3, 4, 5, 6, 7, 8, 10, 11, 15)$$
$$z(A, B, C, D) = \sum (1, 2, 8, 12, 13).$$

Or

(b) Design a combinational circuit using a ROM. The circuit should accept a 3-bit number and generate an output binary number equal to the square of the input number.

[5 × 10 = 50 marks]