D 123871 **(Pages : 4)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

B.TECH. (2019 SCHEME)

EN 19 401—ENGINEERING MATHEMATICS—IV

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. The joint density of X and Y is given by :

$$f(x, y) = \begin{cases} e^{-(x+y)}, & \text{for } x \geq 0, y \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

Find $P\left(\frac{1}{2} < X < 2, 0 < Y < 4\right)$.

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

is a joint pdf, find the marginal density functions. Are X and Y statistically independent ?

3. If $f(x, y) = \begin{cases} x^2 + \frac{xy}{3}, & 0 < x < 1, 0 < y < 2 \\ 0, & \text{otherwise} \end{cases}$

is a joint pdf, find $P\left(X < \frac{1}{2} \mid Y < \frac{1}{2}\right)$.

4. Find the probability that atmost 5 defective bolts will be found in a box of 200 bolts if it is known that 2 % of such bolts are expected to be defective.

Turn over

5. If X follows the uniform distribution in $(0, 12)$, find : (i) $P(X < 2)$; (ii) $P(X > 7)$; and (iii) $P(3 < X < 7)$.

6. In a certain city, the daily consumption of electric power, in Millions in Kilowatt hours (mkh) may be regarded as a random variable having a gamma distribution with $\alpha = 3$ and $\beta = 2$. If the power plant has a daily capacity of 12 mkh, what is the probability that this power supply will be inadequate on any given day ?

7. A sample of 100 items gave a mean 7.4 kg. and a S.D. 1.2 kg. Find 99 % confidence limits for the population mean.

8. The marks secured by a sample of 36 students of a college in a class give a mean of 55 and a S.D. of 10. Test the hypothesis that the mean of the college is 50 at 5 % level.

9. Given the following data. Test whether the means of the sample differ significantly :

Sample		*Size*	*Mean*
1	...	50	140
2	...	60	150

Where S.D. of the population is 10, at 5 % level of significance.

10. Verify whether $w = \sin z$ is analytic. If so find $\frac{dw}{dz}$.

11. Find the analytic function whose real part is $e^x \cos y$.

12. Discuss the transformation $w = \sin z$.

13. Evaluate $\int_C \frac{\cos \pi z}{z-1} dz$ where C is $|z| = 3/2$.

14. Expand $\frac{1}{z}$ about $z = -1$ and $z = 2$ as Taylor's series.

15. Find the poles and residues of $\frac{z+1}{z^2-2z}$.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

Each question carries 10 *marks.*

16. (A) Find k if $f(x, y) = k(1-x)(1-y)$ is a joint pdf for $0 < x < 1$ and $0 < y < 1$. Hence find the value of $P\left(0 < x < \frac{1}{2}, \frac{1}{2} < y < 1\right)$. Find the marginal distribution of X and Y. Are X and Y independent ?

Or

(B) If X and Y have joint p.d.f. given by :

$$f(x, y) = \frac{2x + 3y}{72},\ x = 0, 1, 2\ ;\ y = 1, 2, 3.$$

(i) Find the marginal and conditional distributions of X and Y.

(ii) Examine whether X and Y are independent.

(iii) Find the conditional distributions of X given $x + y = 3$.

17. (A) Fit a binomial distribution to the following data :

x	:	0	1	2	3	4	5	6	7
y	:	7	6	19	35	30	26	7	1

Or

(B) In a test on 2000 electric bulbs, It was found that the life of a particular make was normally distributed with an average of 2040 hours and S.D. of 60 hours. Estimate the number of bulbs likely to burn for :

(i) More than 2150 hours ;

(ii) Less than 1950 hours ; and

(iii) More than 1960 hours but less than 2160 hours.

Turn over

18. (A) The following table gives the number of air-craft accidents that occurred during the various days of a week. Test whether the accident are uniformly distributed over the week.

Day	: Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
No. of accident :	15	19	13	12	16	15

Or

(B) Two random samples gave the following data :

		Size	*Mean*	*Variance*
Sample I	:	8	9.6	1.2
Sample II	:	11	16.5	2.5

Can we conclude that the two samples have been drawn from the same normal population.

19. (A) (i) Show that $u(x, y) = x^2 - y^2$ and $v(x, y) = \frac{-y}{x^2 + y^2}$ are both harmonic, but $u + iv$ is not analytic.

(ii) Show that the function $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic and hence find its harmonic conjugate.

Or

(B) (i) Find the bilinear transformation which maps the points $(0, 1, -1)$ into points (i, ∞, o).

(ii) Show that the transformation $w = z + \frac{1}{z}$ maps the circle $|z| = c$ into an ellipse. Discuss the case when $c = 1$.

20. (A) Expand $\frac{1}{(z-1)(z-2)}$ in (a) $|z| < 1$; (b) $1 < |z| < 2$; (c) $|z| > 2$; and (d) $0 < |z - 1| < 1$.

Or

(B) Evaluate $\int_0^{2\pi} \frac{d\theta}{5 + 4\sin\theta}$.

(5 × 10 = 50 marks)

D 116220 **(Pages : 4)** **Name.....**

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE (2024 SCHEME) [REGULAR] EXAMINATION, NOVEMBER 2024

B.TECH. (2024 SCHEME)

EN 24 101—ENGINEERING MATHEMATICS I

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

I. 1 Explain the maximal and minimal property of the gradient and give an example.

2 Show that the function $f(x) = 1 - \sqrt{1 - x^2}$ is continuous on the interval [– 1, 1].

3 Find the local maximum and local minimum values of the function $g(x) = x + 2 \sin x$.

4 Evaluate $\int_1^a \int_2^b \frac{1}{xy}\, dx\, dy$.

5. Change the order of integration in

$$\int_0^1 \int_{x^2}^{2-x} f(x, y)\, dy dx.$$

6 Sketch the region of integration of the of the integral

$$\int_0^1 \int_0^x f(x, y)\, dy dx$$

and change the order of integration.

7 Find the Directional derivative of $\varphi = 4xz2 + x2yz$ at (1, – 2, 1) in the direction

$2i^{\rightarrow} + 3j^{\rightarrow} + 4k^{\rightarrow\rightarrow}$

8 Give the unit normal vector to the surface $x2 + y2 + z2 = 1$ at (1, 1, 1).

Turn over

9 Show that curl (grad φ) = 0.

10 Find the scalar potential, if the vector field $F^{\rightarrow} = (x2 + xy2)\, i^{\rightarrow} + (y2 + x2y)\, j^{\rightarrow}$ is irrotational.

11 If $F^{\rightarrow} = 3xyi^{\rightarrow} - y2j, ^{\rightarrow\rightarrow}$ Evaluate $\int F^{\rightarrow} \cdot dr^{\rightarrow}$, where C is the arc of the parabola $y = 2x^2$ from the point (0, 0) to the point (1, 2).

12 Evaluate using Gauss Divergence theorem for $F^{\rightarrow} = 4xzi^{\rightarrow} - y2j^{\rightarrow} + + yzk^{\rightarrow\rightarrow}$ taken over the cube $x = 0, y = 0, z = 0, x = 1, y = 1, z = 1$.

13 Find the sum and product of the eigen values of

$$A = \begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}.$$

14 If the eigen values of the matrix A of order 3 × 3 are 2, 3 and 1, then find the determinant of A.

15 Define Index, Signature and Rank.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

II. 1. (i) Find an equation of the tangent line to the parabola $y = x^2$ at the point (1, 1).

(ii) If $u = \sin^{-1}\left(\frac{x^3 - y^3}{x + y}\right)$ then prove that $x\, \partial u\, \partial x + y\, \partial u\, \partial y = 2 \tan u$.

Or

2. (i) If $u = f\,(2x - 3y, 3y - 4z, 4z - 2x)$ then find $1/2\, \partial u / \partial x + 1/3\, \partial u / \partial y + 1/4\, \partial u / \partial z$.

(ii) Find the Maximum and Minimum of $f(x, y) = x^3 + y^3 - 3x - 12y + 20$.

3. (i) Find by double integral, the area enclosed by the curves and $y^2 = 4\, ax$ and $x^2 = 4\, ay$.

(ii) Using triple integration, find the volume of the sphere $x^2y^2z^2 = a^2$.

Or

4 (i) Evaluate by changing into polar co-ordinates the integral $\int_0^a \int_y^a \frac{x}{x^2 + y^2}\, dxdy$.

(ii) Find the area bounded by the parabolas $y^2 = 4 - x$ and $y^2 = x$.

5 (i) Find the Directional Derivative of $\varphi = 3x2yz + 4xz2 + xyz$ at (1, 2, 3) in the direction of $2i^{\rightarrow} + j^{\rightarrow} - k^{\rightarrow\rightarrow}$.

(ii) Find the constants a and b, so that the surfaces $5x2 - 2yz - 9x = 0$ and $ax2y + bz3 = 4$ may cut orthogonally at the point (1, –1, 2).

Or

6 (i) Find the value of a, b, c so that the vector

$$F^{\rightarrow} = (x + y + az)\, i^{\rightarrow} + (bx - 2y - z)\, j^{\rightarrow} + (-x + cy + 2k)\, k^{\rightarrow\rightarrow}$$

may be irrotational. Also find its scalar potential.

(ii) Calculate the angle between the normal to the surface $xy = z2$ at the points (4, 1, 2) and (3, 3, – 3).

7 Verify the Stokes theorem is verified for $F^{\rightarrow} = (y - z)\, i^{\rightarrow} + (yz)\, j^{\rightarrow} - xzk^{\rightarrow\rightarrow}$ where S is the surface of the cube formed by $x = 0$, $x = 1$, $y = 0$, $y = 1$, $z = 0$ and $z = 1$ above the XY-plane.

Or

8 Verify Gauss divergence theorem for $F^{\rightarrow} = (x3)\, i^{\rightarrow} + (y3) j^{\rightarrow} + z3k^{\rightarrow\rightarrow}$ where s is the surface of the cuboid formed by the planes $x = 0, x = a, y = 0, y = a, z = 0, z = a$.

9 Find the eigen values and eigen vectors of the matrix

$$A = \begin{pmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}.$$

Or

Turn over

10 Verify Cayley-Hamilton theorem and hence find A^{-1} of

$$A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}.$$

(5 × 10 = 50 marks)

D 123874 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 404—HYDRAULIC MACHINERY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the Impulse Momentum equation and its applications.
2. Discuss the reaction principle and its role in ship propulsion.
3. Differentiate between axial flow and radial flow machines.
4. Compare impulse and reaction turbines with examples.
5. Explain Euler's turbine equation and its significance.
6. What are the construction features of Pelton wheel turbines ?
7. Describe the classification of rotodynamic pumps.
8. Explain the working of centrifugal pumps and the role of priming.
9. Discuss the importance of NPSH in pump selection.
10. Define cavitation and explain the factors affecting cavitation in pumps.
11. Explain Buckingham's Pi theorem and its applications.
12. What are the effects of specific speed on runner speed and runner size?
13. Explain the working principle of reciprocating pumps.

Turn over

14. Discuss the significance of slip and efficiency in pumps.

15. Compare gear pumps and vane pumps in hydraulic applications.

(10 × 5 = 50 marks)

Part B

Answer the following questions.

16. Derive the basic equation of energy transfer in rotodynamic machines.

Or

17. Explain the construction and performance characteristics of Kaplan turbines.

18. Discuss the theory of draft tube and its importance in turbine efficiency.

Or

19. Explain the selection criteria for pumps used in industrial applications.

20. Describe the classification of impellers and their impact on pump performance.

Or

21. Discuss different types of casing used in pumping machinery.

22. Explain Rayleigh's method and its application in dimensional analysis.

Or

23. What are the causes and remedies for cavitation damage in turbines ?

24. Explain the working of jet pumps with neat sketches.

Or

25. Discuss the applications and limitations of hydraulic accumulators.

(5 × 10 = 50 marks)

D 123878 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 404—PRINTING MATERIAL SCIENCE

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Discuss the optical properties of colloids.
2. What are the applications of gum Arabic in printing industry ? Explain.
3. Write notes on light sensitive coatings.
4. Discuss the preparation and properties of solid photopolymer flexo plates.
5. Explain the manufacturing process, properties and uses of polyimides in printing industry.
6. Discuss the features of diazo compounds and photopolymers.
7. Explain the properties and applications of thikol rubber.
8. Discuss the features of different types of adhesives.
9. Explain various types of resins used in printing ink.
10. What are the features of twin wire formed paper ?
11. What are the features of coated and commercial papers ?
12. Compare the features of writing and printing papers.
13. What are the methods of graining offset plates ? Explain.

Turn over

14. Discuss the applications of various metals as printing substrates.

15. Explain various tests done on metal substrates used for printing.

(10 × 5 = 50 marks)

Part B

Each question carries 10 *marks.*

16. What are the different purification methods of colloids ? Explain.

Or

17. Explain different types of colloidal systems.

18. Discuss various condensation polymers and their uses in printing industry.

Or

19. Explain the manufacturing, properties and uses of polyesters in printing industry.

20. Discuss various types of pigments along with its properties.

Or

21. Explain the purpose and features of 5 types of additives used in the printing ink.

22. Discuss various types of paper substrates.

Or

23. Discuss various properties required for paper to be used for flexographic printing.

24. Explain various tests done on metal substrates used for printing.

Or

25. Explain various tests done on plastic substrates used for printing.

(5 × 10 = 50 marks)

D 123882 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 404—DIGITAL ELECTRONICS AND LOGIC CIRCUITS

Time : Three Hours Maximum : 100 Marks

Part A

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

I. 1 Convert the binary number 10112 to gray code and the binary number 11011110 into its decimal equivalent.

2 Distinguish signed and unsigned numbers

3 Convert the given decimal numbers to their binary equivalent 108.364.

4 What is binary coded decimal ? Explain.

5 Paraphrase the merits of code converters ?

6 Interpret the characteristics of demultiplexer.

7 How many flip-flops are required to build a binary counter that counts from 0 to 7 ?

8 Show how the JK flip-flop can be modified into a D flip-flop or a T flip-flop.

9 Distinguish combinational and sequential circuits.

10 How programmable logic devices are classified ?

11 What is PAL ? How does it differ from PLA ?

12 Compare and contrast static RAM and dynamic RAM.

13 Explain priority interrupts of 8085.

14 Explain the different registers available in 8085.

15 Recall the instruction sets in 8085.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **all** *questions.*

II. 1 i) Subtract the two numbers using 10's complement 6,428 - 3,409

ii) Represent the decimal number 5.137 in (i) BCD code (ii) Excess-3 code

Or

2 i) Convert $(725.25)8$ to its decimal, binary and Hexadecimal equivalent.

ii) Find 1's and 2's Complement of 8 digit binary number 10101101.

3 Using K-map method, Reduce the following Boolean function $F = \sum m(0, 2, 3, 6, 7) + d(8, 10, 11, 15)$ and obtain minimal SOP.

Or

4 Demonstrate on a 2-bit magnitude comparator with three outputs : A > B, A = B and A < B.

5 Explain in detail about the pulse- triggered S-R Flip-Flop with necessary diagrams.

Or

6 Using D flip-flop, Design a synchronous counter which counts in the sequence

000, 001, 010, 011, 100, 101, 110, 111, 000.

7 Design a combinational circuit using a ROM. The circuit accepts a three-bit number and outputs a binary number equal to the square of the input number.

Or

8 Differentiate static and dynamic RAM. Draw the circuits of one cell of each and explain its working principle.

9 Explain the architecture of 8085 with neat sketch.

Or

10 Illustrate the different addressing modes of 8085 microprocessor with examples.

(5 × 10 = 50 marks)

D 123886 **(Pages : 3)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 404—ANALOG COMMUNICATION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. With necessary expressions, Explain single-tone AM.
2. Why modulation is necessary in electronic communication ? Explain in detail.
3. Compare DSB-SC and SSB-SC modulation schemes with respect to bandwidth and system complexity.
4. A sinusoidal carrier signal of 5 V peak amplitude and 100 khz frequency is amplitude modulated by a 5 Khz signal of peak amplitude 3 V. What is the modulation index and bandwidth ?
5. With neat sketches, explain the principles of a Square law detector.
6. With necessary sketches, explain the spectrum of FM.
7. Draw and explain Phase locked loop FM demodulator
8. Explain the function of a Synchronous demodulator.
9. Explain how PPM can be generated from PWM signals.
10. What is meant by Ensemble average ? Explain with an example.
11. With examples, explain stationary processes.
12. Show that for a finite variance σ^2, the Gaussian random variable has the largest differential entropy attainable by any random variable.

Turn over

13. Describe thermal noise and shot noise.

14. If each stage has a gain of 10 dB and noise figure of 10 dB. Calculate the overall noise figure of a two-stage cascaded amplifier.

15. Explain the noise performance of DSB-SC scheme with the help of neat block diagram

(10 × 5 = 50 marks)

Part B

Answer **one** *question from each module.*

Each question carries 10 *marks.*

MODULE I

16. Derive Expressions for the amplitude modulated wave, its current and power relations

(10 marks)

Or

17. Obtain the band width and frequency spectrum of AM wave, with the help of mathematical equations.

(10 marks)

MODULE II

18. Derive the expression for DSB-SC AM and calculate its power and efficiency. Explain a method to generate it.

(10 marks)

Or

19. Derive an expression for figure of merit for SSB-SC system. (10 marks)

MODULE III

20. With a block diagram, explain Frequency Synthesis. (10 marks)

Or

21. With a neat sketch, explain the detection/ demodulation of Pulse Duration Modulation.

(10 marks)

MODULE IV

22. (a) What is meant by Gaussian process ? Explain in detail. (5 marks)

(b) Explain the features of filtered random signal. (5 marks)

Or

23. Let $X(\tau) = A\cos(\omega t + \varphi)$ and $Y(t) = A\sin(\omega t + \varphi)$ where A and ω are constants and φ is uniform random variable in $(0, 2\pi)$. Find the cross correlation function $x(t)$ and $y(t)$.

(10 marks)

MODULE V

24. Draw and explain a Model of receiver for CW modulation with noise. (10 marks)

Or

25. Classify the different types of noise and also comment its causes and effects. (10 marks)

[5 × 10 = 50 marks]

D 123890 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Information Technology

IT 19 404—OPERATING SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Define Operating System. List out the objectives of an operating system.
2. Write the benefits of open source operating systems.
3. Elaborate the process of debugging.
4. Differentiate process and threads.
5. Specify the types of multithreading models with diagram.
6. Explain the role of CPU scheduler and dispatcher in CPU scheduling.
7. Highlight the four conditions under which a deadlock situation may arise.
8. Describe the process of swapping in memory management.
9. Explain the basic concepts of segmentation.
10. Discuss about file system mounting in detail.
11. Mention the significance of free space management and list its types of implementations.
12. How the performance of multiple disks improved by parallel access ? Explain.
13. Write short notes on domain of protection.
14. List and explain five security violations in a computer system.
15. Enumerate the differences between threat and attack.

(10 × 5 = 50 marks)

Turn over

Part B

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

16. a) List the functionalities of operating system in connection with process management and memory management.

Or

b) Enumerate the categories of system calls each with its responsibilities.

17. a) With a neat sketch, explain process states and process control block.

Or

b) Illustrate the classical problems of synchronization.

18. a) Explain the different techniques to recover a system from deadlock.

Or

b) Outline the procedure for handling page fault in demand paging and explain how it can affect system performance.

19. a) Write a detailed note on various file access methods with neat sketch.

Or

b) Summarize various levels of RAID organization with diagram.

20. a) Compare and contrast several methods of implementing access matrix.

Or

b) Explain the components and kernel modules of Linux operating system with diagram.

(5 × 10 = 50 marks)

D 123872 **(Pages : 3)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 402—COMPUTER PROGRAMMING IN C

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Describe the process of compilation and execution of a high-level program using a compiler.
2. Compare and contrast procedural programming and object-oriented programming.
3. Draw a flowchart to find the sum of first 50 natural numbers.
4. Discuss about header files in C with examples.
5. Develop a C program to print day of week using switch case.
6. Describe three logical bitwise operators. What is the purpose of each operator ?
7. Write a C program to find the given number is prime or not.
8. Write a C program to remove the duplicate element in an array.
9. Write a C program to copy one string to another without using any standard library functions.
10. Illustrate the concept of recursion with example.
11. List the advantages of using pointers.
12. Write a C program to find the sum of two numbers using pointers.
13. Find the means of X and Y variables from the following two regression equations :

$4x - 5y + 33 = 0$
$20x - 9y - 107 = 0.$

Turn over

14. By Gauss elimination method, solve $x + y = 2$ and $2x + 3y = 5$.

15. Solve the linear system $x + y = 2$ and $2x + 3y = 5$ by Gauss-Jordan method.

(10 × 5 = 50 marks)

Part B

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

16. a) Describe in detail about anatomy of a computer.

Or

b) Design the algorithm for finding roots of a quadratic equation and draw the flowchart.

17. a) Find the individual digits in a given N digit number. Add all odd individual digits and print their sum. Eg : If the number is 4583 then individual digits are : 4, 5, 8, 3 Sum of odd digits is : 5 + 3 = 8.

Or

b) Write a C program that performs the following operations using inbuilt functions.

i) Find the remainder of a division operation. (2 marks)

ii) Find the quotient of a division operation. (2 marks)

iii) Find the square of a number. (2 marks)

iv) Find the square root of a number. (2 marks)

v) Find the cube value of a number. (2 marks)

18. a) What is an Array ? Explain the declaration and initialization of one and two dimensional arrays with an example.

Or

b) Write a C program that takes the name of a person as input and prints the name in an abbreviated fashion, e.g., Mahatma Gandhi as M.G.

19. a) Write a program using a function to get a line of input string from the user and count the number of vowels in the given string.

Or

b) Explain pointers to functions with an example.

20. a) In a laboratory experiment on correlation research study the equation of the two regression lines were found to be $2X - Y + 1 = 0$ and $3X - 2Y + 7 = 0$. Find the means of X and Y. Also work out the values of the regression co-efficient and correlation between the two variables X and Y.

Or

b) Write a C program to implement Gauss-Seidel's iteration method with the entry of row wise co-efficients and right hand vectors.

(5 × 10 = 50 marks)

D 123876 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Printing Technology

PT 19 402—OFFSET TECHNOLOGY

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the parts of a sheet-fed offset press with neat diagram.
2. List the advantages and disadvantages of offset printing.
3. Explain the parts of the feeder unit on a sheet-fed offset press with near diagram.
4. Explain the principle of No and Early sheet detectors.
5. What are bearer and non-bearer presses ? Describe.
6. Describe the impression cylinder of an offset press.
7. Explain the significance of pH and conductivity of dampening solution.
8. Explain the principle of conventional dampening system with neat diagram.
9. Explain the difference between continuous dampening and intermittent dampening.
10. Brief on premake-ready operations.
11. Explain the significance of color sequence in multicolour offset printing.
12. What is intermittent inking in offset printing ? Explain.
13. Explain the parts of a rotating turret unwind stand.
14. List the sequence of operations carried out during splice preparation.
15. Brief on the parts of a former folding unit.

(10 × 5 = 50 marks)

Turn over

Part B

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

16. Describe the sheet control and guiding devices used at the delivery side of a sheet-fed offset press with simple diagrams.

Or

17. Explain in detail the components of stream feeder.

18. What are the different types of sheet detectors used on sheet feeder ? Explain each with simple sketches.

Or

19. Discuss the mechanisms of mechanical, electromechanical and pneumatic type of sheet detectors used on sheet-fed offset press.

20. Describe the parts of any dampening unit with neat diagram.

Or

21. Describe the different types of continuous flow dampening systems with neat diagrams.

22. What are the different types of blankets used in offset printing ? Explain in detail. Give an account of blanket thickness and hardness.

Or

23. Define the printing problem, mention the cause of the problem and give solutions to such print problems :

    a) Tinting ;

    b) Scumming ;

    c) Misregistration ; and

    d) Snowflaking

24. Discuss the following: Plate scanner, Scanning Densitometer, Stroboscope and Ink Agitator

Or

25. Describe the function and working principle of dryers and chill rolls used on web offset presses.

(5 × 10 = 50 marks)

D 123880 **(Pages : 3)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 402—ELECTROMAGNETIC FIELD THEORY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

I. 1 Interpret the physical significance of curl of a vector field.

2 Using Gauss law, derive the expression for electric field intensity due to an infinite length of line charge.

3 A dielectric sphere of $\varepsilon r = 5.7$ and of radius 10 cm. has a point charge 2 μC placed at its centre. Calculate the surface density of polarization charge on the surface of the sphere.

4 Identify equation of Ohm's law in point form.

5 Find the energy stored in inductor having current of 3A flowing through the inductor of 100 mH.

6 Two parallel current carrying conductors separated by a distance of 4 m. carries current of 10 A and 15 A in opposite directions. Find the force on each conductor. Find the field intensity at mid-point between the two conductors.

7 Point out the relation between magnetic flux density and magnetic field intensity.

8 If the magnetic field $H = (3x\cos\beta + 6y\sin\alpha)\, az$, Determine the current density J if fields are invariant with time.

9 Explain the concept of displacement current and obtain an expression for the Displacement current density.

10 How can distinguish a medium is a good conductor or dielectric ?

Turn over

11 Obtain the Maxwell's equation for harmonically varying fields.

12 Formulate the significance of ratio of conduction current density and displacement current density.

13 What is the significance of pointing vector and pointing theorem in Electromagnetic fields ?

14 Explain doppler effect.

15 Outline Characteristic Impedance.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

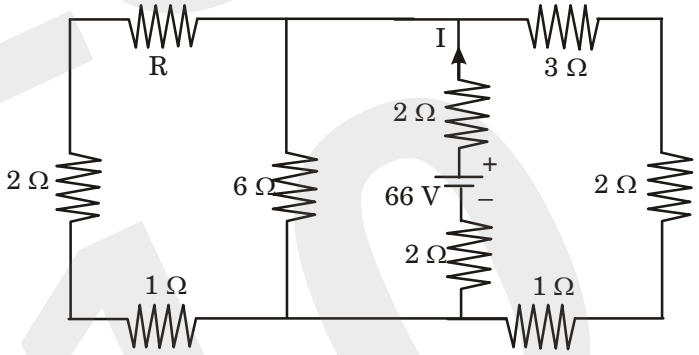
II. 1 State and prove divergence theorem for a given differential volume element.

Or

2 i Derive the expressions for Electric field intensity and potential due to an electric dipole.

ii A parallel plate capacitor having a mica dielectric εr = 6, plate area of 625 cm^2 and a separation of 2.5 cm, a potential of 100 VX is applied. Find the energy stored in the capacitor.

3 Find the value of resistance R, if the current is I = 11 A and source voltage is 66 V as shown in figure :



Or

4. (i) Derive the magnetic field intensity due to an infinite length current carrying conductor by using Biot Savart's law.

(ii) Derive the expressions for the self-inductances of a solenoid and a toroid.

5 (i) State and explain Faraday's laws of electromagnetic induction with some examples.

(ii) A 30 cm. × 40 cm. loop rotates at 130 rad/s in a magnetic field 0.06 Wb/m^2 normal to the axis of rotation. If the loop has 50 turns, determine the induced voltage in the loop.

Or

6 (i) Illustrate with necessary fundamentals the equation of continuity of current in differential form.

(ii) Obtain the motional EMF induced in moving closed path in static B field.

7 Analyze the physical interpretation of Maxwell's first and second equations.

Or

8 Explain in detail on retarded scalar and vector potential and derive the generalized wave equation in free space.

9 Calculate the skin depth and wave velocity at 2 MHz in aluminium with conductivity 40 MS/m. and $\mu r = 1$.

Or

10 Define reflection co-efficient ? Derive the equations when wave is propagating between two dielectric mediums with normal incidence ?

(5 × 10 = 50 marks)

D 123884 **(Pages : 4)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 402—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

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

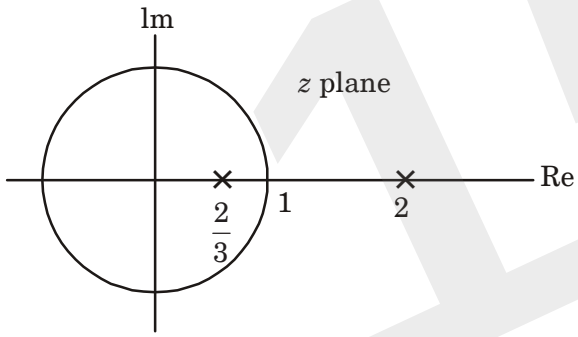
1. What is meant by invertibility ? Explain with examples.
2. Check whether the following systems are causal or not ?

   (i) $y(t) = x^2(t) + x(t-4)$; (ii) $y(t) = x(t/2)$; and (iii) $y(n) = x(2n)$.
3. The system is described by $y[n] = x(2n)$. Classify it as static or dynamic and also causal or non-causal system.
4. Construct the Fourier Series co-efficients of the signal,

   $x(t) = 4(\cos t)(\sin 4t)$
5. State and explain synthesis and analysis equation of CTFT.
6. State and explain Fourier Integral theorem.
7. Derive Laplace Transform of Parabolic Function.
8. Discuss about the Properties of the ROC of Laplace transform.
9. State and prove time differentiation and time integration property of Laplace transform.
10. Explain the different types of Mathematical representation of discrete time signals.
11. Find the DTFT of $x[n] = u[n] - u[n - N]$,
12. Determine the DTFS co-efficients for the discrete time signal $x[n] = \cos(2\pi n/3) + \sin(2\pi/7)$.
13. State and prove initial and final value theorem of Z-transforms.

Turn over

14. Pole zero plot for Z transform X (z) of a discrete time signal x [n] shown below :



Determine the ROC in each of the following cases :

(i) x [n] is right sided.

(ii) Fourier transform of x [n] converges.

(iii) x [n] is left sided.

15. Consider a LTI system characterised by input output relationship :

$$y[n] - \frac{1}{4} y[n-1] = x[n] + \frac{1}{6} x[n-1]$$

(i) Compute the system function H (z).

(ii) Sketch the possible ROCs for H (z).

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

16. Explain the classification of continuous and discrete time signals with its mathematical representation.

(10 mark)

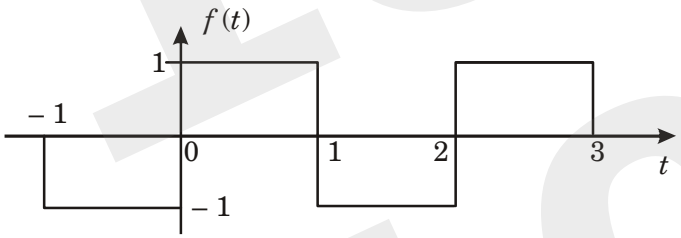
Or

17. (a) List the methods to compute the convolution sum along with steps. (5 marks)

(b) Find the linear convolution of $x(n) = \{1, 2, 3, 4, 5, 6, 7\}$ with $h(n) = \{2, 4, 6, 8\}$.

(5 mark)

18. (a) Find the exponential Fourier series of the waveform shown in figure. Also plot



the magnitude spectrum with $n = 0, 1, 2, 3, 4$ and 5.

(7 marks)

(b) State and prove the time differentiation property of continuous time Fourier Transform.

(3 marks)

Or

19. Construct the Fourier Series co-efficients of the signal, $x(t) = 4 (\cos t) (\sin 4t)$.

(10 marks)

20. Draw the pole-zero plot of the following function in s-domain and hence find the time domain response. $F(s) = 2/(s(s^2 + 2s + s))$.

(10 marks)

Or

21. (a) Solve the inverse Laplace transform of $x(s) = (s + 3)/((s + 1)(s + 2)^2)$.

(7 marks)

(b) Calculate the initial value of signal $x(t)$ whose

Laplace Transform is $x(s) = (s + 5)/(s^2 + 3s + 2)$.

(3 marks)

Turn over

22. (a) Determine the DTFT of the signal $x\,[n] = u\,[n] - u\,[n - N]$. (6 marks)

(b) Illustrate scaling property of DTFT. (4 marks)

Or

23. (a) State and explain Parseval's theorem for DFS. (5 marks)

(b) Illustrate convolution property of DFS. (5 marks)

24. (a) Prove that the final value of $x\,(n)$ for $X\,(z) = z^2/(z - 1)\,(z - 0.2)$ is 1.25 and its final value is unity.

(5 marks)

(b) Find the inverse Z-transform of $X\,(z) = (z - 1)/(3 - 4z^{-1} + z^{-2})$, ROC : $|z| > 1$.

(5 marks)

Or

25. A system is described by the difference equation $y\,(n) - (1/2)\,y\,(n - 1) = 5x\,(n)$. Identify and Determine the solution, when the $x\,(n) = (1/5)^n u\,(n)$ and the initial condition is given by $y\,(-1) = 1$, using z transform.

(10 marks)

[5 × 10 = 50 marks]

D 123888 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Information Technology

IT 19 402—DIGITAL DATA COMMUNICATION

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Define Protocol. Enumerate the key elements of a protocol.
2. Explain the factors that affect transmission impairment in signals.
3. Tabulate the differences between analog and digital signals.
4. Define unipolar, polar and bipolar encoding schemes used in digital transmission.
5. Explan Delta modulation technique with a neat diagram.
6. Elaborate the two forms of phase shift keying.
7. How can errors be detected and corrected by using linear block code ?
8. Calculate the pair wise Hamming distance of the following code words : 01101010, 11011011, 11011001 and 10011101. Find the minimum Hamming distance among them ?
9. Write short notes on Frequency Hopping Spread Spectrum (FHSS).
10. Explain the working of datagram networks.
11. Discuss the mechanism of stop and wait protocol in noiseless channels.
12. List and explain the services provided by point-to-point protocol.
13. Specify the method of token passing inside a logical ring in controlled access.
14. Explain Select and Poll functions used in polling access method.
15. Define channelization and enumerate three protocols in channelization.

(10 × 5 = 50 marks)

Turn over

Part B

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

16. a) Illustrate the functionalities of various layers in the OSI model with diagram.

Or

b) Draw and Compare the performance of each network model with its advantages and disadvantages.

17. a) Describe the categories of transmission media in data communications.

Or

b) Explain how analog-to-analog conversion can be done in three ways.

18. a) Discuss the significance of Cyclic Redundancy Check in error correction.

Or

b) Illustrate Frequency Division Multiplexing and Wavelength Division Multiplexing with diagram.

19. a) Demonstrate the process of communication takes place in a circuit switched network with diagram.

Or

b) Explain the functions of framing, flow and error control in data link layer.

20. a) Discuss the improvements of CSMA, CSMA/CD and CSMA/CA in random access method.

Or

b) Examine the working of FDMA, TDMA and CDMA with diagram.

(5 × 10 = 50 marks)

D 123873 **(Pages : 4)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 403—THERMODYNAMICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the difference between the macroscopic and microscopic approaches in thermodynamics. How do these approaches contribute to the understanding of thermodynamic systems ?
2. Discuss the concept of thermodynamic equilibrium. How is it related to the Zeroth law of thermodynamics, and how is temperature measured using this law ?
3. What are homogeneous and heterogeneous systems in thermodynamics ? Provide examples of each and explain how the concept of a continuum is applied in these systems.
4. State and explain the First Law of Thermodynamics. How does it relate to the concept of internal energy and enthalpy in a closed system ?
5. Derive the expression for work done in a thermodynamic process involving a gas, considering both reversible and irreversible processes.
6. Explain the Steady Flow Energy Equation and discuss its applications with respect to a steady flow system, such as a turbine or compressor.
7. State and explain the Kelvin-Planck and Clausius statements of the Second Law of Thermodynamics. How do these statements lead to the concept of irreversibility in thermodynamic processes ?
8. Describe the Carnot cycle. Explain Carnot's theorem and its significance in determining the maximum efficiency of heat engines.

Turn over

9. What is entropy ? Explain the Clausius inequality and discuss its role in the application of the Second Law of Thermodynamics.

10. Define the concept of a pure substance and explain its phase transformations. Discuss the T-v, p-v, and p-T diagrams for a pure substance.

11. What is the significance of the Mollier chart (h-s diagram) for steam, and how is it used in thermodynamic calculations ?

12. Explain the Van der Waals equation of state. How does it differ from the ideal gas law, and what does it signify regarding real gases ?

13. Discuss Dalton's Law of partial pressures and its application in mixtures of ideal gases. How is the total pressure of a gas mixture determined ?

14. Derive the equation for the internal energy, enthalpy, and entropy of a gas mixture. What are the important thermodynamic properties in a mixture of ideal gases ?

15. State the Maxwell Relations and discuss how they can be used to derive other thermodynamic equations. Provide an example of their application.

(10 × 5 = 50 marks)

Part B

Each question carries 10 *marks.*

16. Differentiate between macroscopic and microscopic approaches in thermodynamics. Explain how the concept of a system and control volume is used to analyze thermodynamic processes. Illustrate with examples from engineering applications.

Or

17. Discuss the Zeroth Law of Thermodynamics. How does it lead to the concept of temperature ? Explain the differences between the Celsius, Kelvin, and Rankine temperature scales, and show how absolute zero is defined in these scales.

18. Air at 80 kpa, 27°C and 220 m/s enters a diffuser at a rate of 2.5 kg/s and leaves at 42 °C. The exit area of the diffuser is 400 cm^2. The air is estimated to lose heat at a rate of 18 kJ/s during this process : (i) The exit velocity ; and (ii) The exit pressure of the air.

Or

19. A Piston-cylinder device contains 0.15 kg of air initially at 2 MPa and 350°C. The air is first expended isothermally to 500 kPa, then compressed polytropically with a polytropic exponent of 1.2 to the initial pressure and finally compressed at the constant pressure to the initial state. Determine the boundary work for each process and the network of the cycle.

20. In a Carnot cycle the maximum pressure and temperature are limited to 18 bar and 410°C. The volume ratio of isentropic compression is 6 and isothermal expansion is 1.5. Assume the volume of the air at the beginning of isothermal expansion as 0.18m^3. Show the cycle P-V and T-S diagram and determine : (i) The pressure and temperature at main points ; and (ii) Thermal efficiency of the cycle.

Or

21. 5m^3 of air at 2 bar 27°C is compressed up to 6 bar pressure following PV1.2 = constant. It is subsequently expanded adiabatically to 2 bar. Considering the two process to be reversible, determine he network, net heat transfer, change in entropy. Also plot the process on T-S and P-V diagram.

22. A large insulated vessel is divided into two chambers one containing 5 kg. of dry saturated steam at 0.2 MPa and the other 10 kg. of steam 0.8 quality at 0.5 MPa. If the partition between the chambers is removed and the steam is mixed thoroughly and allowed to settle, find the final pressure, steam quality and entropy change in the process.

Or

23. What is the total pressure inside a 2 L container that contains 1 g of Ne, 1 g of N_2 and 1 g of CO_2 ? What is the partial pressure of neon in the mixture ? All pressure measured at 25 °C.

Turn over

24. Derive Maxwell relations.

Or

25. The sling psychrometer in a laboratory test recorded the following readings.

Dry bulb temperature = 35°C, Wet bulb temperature = 25°C

Calculate the following :

(i) Specific humidity.

(ii) Relative humidity.

(iii) Vapour density in air.

(iv) Dew point temperature.

(v) Enthalpy of mixture per kg of dry air.

Take atmospheric pressure = 1.0132 bar.

(5 × 10 = 50 marks)

D 123877 **(Pages : 4)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 403—STRENGTH OF MATERIAL

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the chemical composition of Portland cement and its role in the hydration process.
2. Describe the differences between high-strength concrete and high-performance concrete.
3. Briefly discuss the significance of foundations in your field of engineering.
4. Explain the concept of orthotropic materials and their applications in engineering.
5. Derive the equation for the total elongation of a tapered bar due to its self-weight.
6. Explain the concept of viscoelasticity and its importance in material science.
7. Sketch and explain the different types of supports used in beam structures.
8. List down 5 limitations in theory of simple bending.
9. Describe the process of constructing a shear force diagram for a simply supported beam with a point load.
10. Explain conjugate beam method.
11. State and prove any one Moment area theorem.
12. Derive the equation for the deflection of a cantilever beam subjected to a point load at its free end.
13. Define the term 'buckling' and explain its significance in the design of columns.

Turn over

14. State and explain the assumptions made in deriving the Euler's formula for column buckling.

15. A solid circular shaft transmits 90 kW power at 150 r.p.m. Calculate the shaft diameter if the twist in the shaft is not to exceed 1° in 3 m. length of the shaft and the shear stress limited to 80×10^6 N/m^2. Take C = 110×10^9 N/m^2.

(10 × 5 = 50 marks)

Part B

Each question carries 10 *marks.*

16. Outline the procedure for conducting a theodolite survey.

Or

17. Describe the method of triangulation in surveying and its applications.

(10 marks)

18. The state of stress at a point in a strained material is as shown in Fig. 1. Determine :

(i) The normal and tangential stress on the plane AB.

(ii) The magnitude of principal stresses.

(iii) The direction of principal planes.

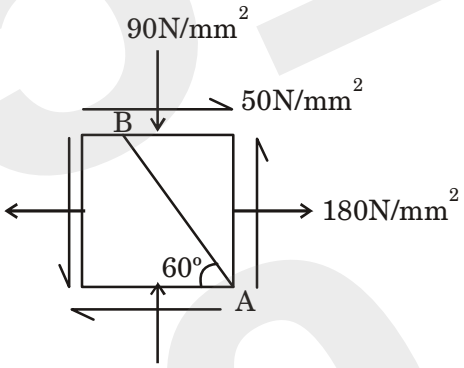
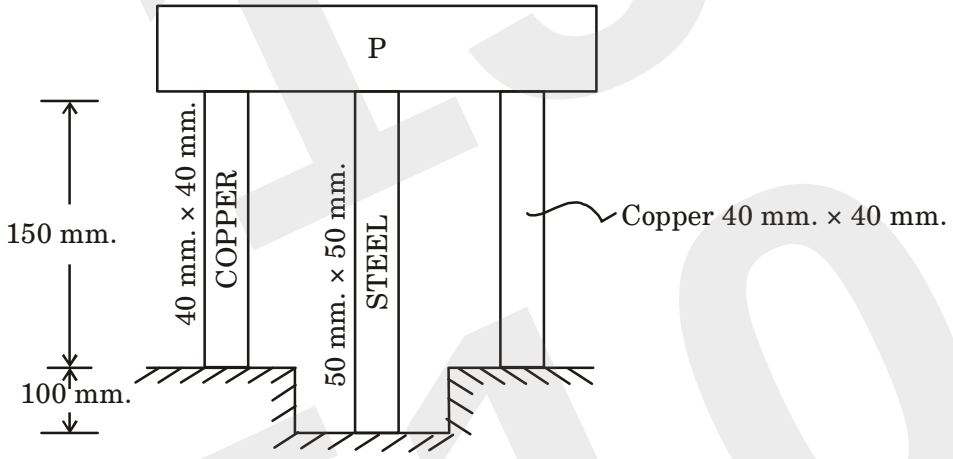


Fig. 1

Or

19. Two copper rods and a steel rod together support a rigid uniform beam weighing P as shown in Fig. 2. The allowable stress in copper and steel are 60 MPa and 120 MPa respectively. Find the magnitude of load P that can be safely supported. Young's modulus for steel is twice that of copper.



20. Draw the SFD and BMD for the beam loaded as shown in Fig. 3.

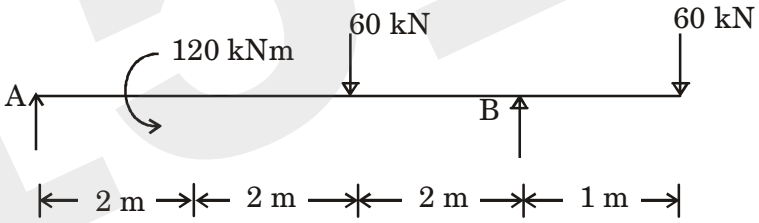


Fig. 3

Or

21. State the assumptions made in the theory of pure torsion. Derive the torsion equation for a circular shaft.

(10 marks)

22. A cantilever beam 4 m. long is loaded with a uniformly distributed load (u.d.l.) of 12 kN/m. over a length of 3 m. from the fixed end. Determine the slope and deflection at the free end of the cantilever. Take I = 12000 cm^4 and E = 210 GPa.

Or

Turn over

23. A simply supported beam AB 8 m. long is subjected to a uniformly distributed load (UDL) of 12 kN/m. over its entire length. Determine the deflection of the beam at its mid-point and . the maximum deflection. Take EI = 45×10^6 Nm^2.

(10 marks)

24. A hollow shaft with an outside diameter of 300 mm. and a wall thickness of 30 mm. is transmitting power at 200 r.p.m. The angle of twist over a length of 4 m. was found to be 1°. Calculate the power transmitted and the maximum shear stress induced in the section. Take G = 84 GPa.

Or

25. A thin cylindrical shell of 4 m. length having a diameter of 1200 mm. and thickness 12 mm. is subjected to an internal fluid pressure of 4 N/mm^2. Find the hoop stress and longitudinal stress. Also calculate the maximum shear stress and change in the dimensions. Take E = 1.8×10^5 N/mm^2. Poisson's ratio = 0.28.

(10 marks)

[5 × 10 = 50 marks]

D 123881 **(Pages : 3)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 403—ELECTRICAL MACHINES I

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

I. 1 Why the armature core in a DC machine is constructed with laminated steel sheets instead of solid steel sheets?

2 Demonstrate the armature reaction in DC Generators ? What are its effects?

3 Why commutator is employed in d.c. machines ?

4 Generalize the requirements of the excitation systems?

5 Why load voltage across DC shunt generator is decreasing with increase in load current ?

6 Summarize the application of various types of Generators.

7 Which method is preferred for controlling the speed of DC shunt motor above the rated speed ? Justify.

8 Summarize the different techniques used to control the speed of DC Shunt motor.

9 Explain the significance of back e.m.f. in a DC Motor ?

10 Give the principle of transformer.

11 Explain ideal transformer and draw its phasor diagram?

12 Differentiate two winding transformer and auto transformer.

13 State the effects of choice of speed and number of poles in a DC machine.

Turn over

14 Distinguish Electrical Loading and Magnetic loading.

15 Compare stacking factor and window space factor.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

II. 1 Classify the types of winding and compare the simplex lap and wave windings.

Or

2 Explain the commutation in detail for a DC Machine. What are the methods to improve.

3 Classify the generators on the basis of excitation and give their e.m.f equations. Use proper diagrams.

Or

4 A 4 pole DC Shunt Generator with lap connected armature supplies 5 kilowatt at 230 Volts. The armature and field copper losses are 360 Watts and 200 Watts respectively. Calculate the armature current and generated EMF ?

5 With neat sketch explain three-point starter to start the DC Shunt Motor.

Or

6 Explain in detail about the Hopkinson's test with necessary calculations.

7 Develop an approximate equivalent circuit diagram of a single-phase transformer.

Or

8 (i) Explain the importance of cooling in a transformer.

(ii) Describe about Tap changing transformers.

9 For a preliminary design of a 1500 kW, 275 V, 300 rpm, d.c. shunt generator determine the number of poles, armature diameter and core length, number of slots and number of conductors per slot. Assume : Average flux density over the pole arc as 0.85 T, Output co-efficient 276, Efficiency 0.91. Slot loading should not exceed 1500 A.

Or

10 A 3 phase, 50 Hz, Oil cooled core type transformer has the following dimensions. Distance between the core centres = 0.2 m, Height of the window = 0.24 m, Diameter of circumscribing circle =0.14 m, The flux density in core = 1.25 Wb/m^2, the current density in the conductor = 2.5 A/mm^2. Assume the window space factor of 0.2 and the core area factor = 0.56. The core area is 2 stepped. Estimate the kVA rating of the transforms.

(5 × 10 = 50 marks)

D 123885 **(Pages : 3)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 403—MICROPROCESSOR AND MICROCONTROLLER

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the functions of pipelining in RISC machines.
2. How data is organized in 8086 ? Explain with examples.
3. Explain the function of code segment in 8086 memory.
4. What are the functions of TEST and READY signals in 8086.
5. List out the general purpose registers in 8086 and list out their functions.
6. Illustrate the operation of SHIFT and ROTATE instructions.
7. List the features of mode 1 used in 8255.
8. State and explain the various command words used in 8259.
9. Differentiate between Burst mode and cycle stealing mode in DMA.
10. How many ports are available in 8051 ? Give the names and functions of each pin.
11. Explain the functions of PC ad SP in 8051.
12. With neat diagrams explain the clock circuits in 8051.
13. Explain the interrupt structure of 8051 microcontroller and also explain how interrupts are prioritized.

Turn over

14. Show how to interface a 7-segment display with 8051.

15. Writ a program to display a character using LCD display.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

16. With a neat diagram, explain the functions of the registers available in BIU of a 8086 microprocessor.

(10 marks)

Or

17. Draw the detailed structure of Flag register. Explain the functions of each flag.

(10 marks)

18. Explain the maximum mode configuration of 8086 by with a neat diagram. Mention the functions of various signals.

(10 marks)

Or

19. Illustrate the classification of 8086 instructions based on its word length.

(10 marks)

20. Describe the internal architectural diagram of the 8237 and explain how it functions as a DMA controller.

(10 marks)

Or

21. (a) Draw the block diagram of traffic light control system using 8086. (5 marks)

(b) Write the algorithm and ALP for traffic light control system. (5 marks)

22. Explain the memory organization and SFR area of 8051 microcontroller. (10 marks)

Or

23. (a) List out instructions for data transfer and logical operations in 8051 with suitable examples. (7 marks)

(b) Identify the rotate and swap instructions with an example. (3 marks)

24. Write an 8051 ALP to generate a square wave of 66 % duty cycle on bit 3 of port 1. (10 marks)

Or

25. How to transfer data between a PC and microcontroller using serial communication ? Draw the necessary diagrams. (10 marks)

[5 × 10 = 50 marks]

D 123889 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Information Technology

IT 19 403—DATA STRUCTURE AND ALGORITHM

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are sparse matrices ? How it is represented using arrays ?
2. Specify the differences between arrays and records.
3. Write a recursive function to find the sum of n numbers to demonstrate the concept of recursion.
4. Explain polynomial addition using linked list with an example.
5. Elaborate push and pop operations on stack using array with its routines.
6. Enumerate the differences between queue and linked list.
7. Explain threaded binary trees with diagram and mention its advantages and disadvantages.
8. How to find the shortest path using Floyd's algorithm ? Explain.
9. What is tree traversal ? Explain the three methods of traversing a tree.
10. Tabulate the differences between linear and binary search.
11. Highlight the different methods of computing hash function.
12. Write briefly about Rehashing and Extendible hashing.
13. Write the procedure in sorting the sequence 64, 25, 12, 22, 11 using selection sort.
14. Outline the steps of insertion sort algorithm and sort the given array :

    4, 3, 2, 10, 12, 1, 5, 6 using insertion sort.
15. Give the algorithm for heap sort and analyze the complexity.

(10 × 5 = 50 marks)

Turn over

Part B

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

16. a) How do we analyze an algorithm's running time ? Explain space and time complexity of an algorithm in detail.

Or

b) Explain asymptotic analysis of an algorithm with its notations in detail.

17. a) Discuss insertion and deletion operations on circular queues and dequeues in detail.

Or

b) Specify an algorithm to evaluate postfix expression using stack and trace the algorithm to calculate the value for the postfix expression "4 5 6 * +".

18. a) Define Binary search tree. Construct a binary search tree for the given data elements -

45, 15, 79, 90, 10, 55, 12, 20, 50.

Or

b) Illustrate depth first search and breadth first search traversals of graph with examples.

19. a) Explain how to search the location of value 31 using binary search with an array of given numbers -

10, 14, 19, 26, 27, 31, 33, 35, 42 and 44.

Or

b) Discuss the types of closed hashing methods involved in collision resolution.

20. a) Illustrate quick sort algorithm with the sorting of given numbers in an array -

24, 9, 29, 14, 19, 27.

Or

b) Illustrate the working of merge sort for the given array-

38, 27, 43, 3, 9, 82, 10.

(5 × 10 = 50 marks)

D 116221 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2024 SCHEME]
{REGULAR} EXAMINATION, NOVEMBER 2024

B.Tech. (2024 Scheme)

PH 24 102 A—ENGINEERING PHYSICS

Time : Three Hours Maximum : 100 Marks

Part A

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

I. 1 Write a short note on phasor representation of simple harmonic motion.

2 What are free and forced vibrations

3 With an example write about Electrical analogy of mechanical oscillators.

4 What are the two types of diffractions ? Give differences between them.

5 Write a short note on antireflection coating.

6 Compare interference and diffraction.

7 Summarize the properties and physical significance of a wave function.

8 Find the de Broglie wavelength of electron whose kinetic energy is 15 eV.

9 State and explain Heisenbergs uncertainty principle and give its physical significance

10 State Gauss's law and mention three applications of it with suitable examples.

11 List the four Maxwells equation for time varying condition.

12 Explain the transverse nature of electromagnetic waves.

13 Explain the different pumping schemes for creating population inversion.

14 Identify the applications of lasers in Engineering.

15 Explain the characteristics of Sound in brief.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **all** *questions.*

II. 1 Discuss the theory of forced oscillations and hence classify the conditions of variation of amplitude and phase with angular frequency.

Or

2 Derive the wave equation on a string.

3 Derive an expression for the de-Broglie wavelength of matter waves in terms of :

(i) Energy ; and

(ii) Voltage.

Or

4 Explain the diffraction due to a plane transmission grating. Obtain the grating equation.

5 Derive time dependent and independent Schrodinger equations.

Or

6 Classify nanomaterial based on dimensionality of quantum confinement and explain the following nanostructures :

(i) Nano sheets ;

(ii) Nano wires ; and

(iii) Quantum dots.

7 Describe the concept of divergence. What is its physical significance ? Derive Gauss divergence theorem.

Or

8 Develop the Electromagnetic wave equation in free space, velocity of Electromagnetic waves in free space.

9 Explain the principle, construction and working of Ruby laser.

Or

10 Derive expressions for growth and decay of energy density inside a hall and deduce Sabine's formula for the reverberation time of the hall.

(5 × 10 = 50 marks)

D 116222 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2024 SCHEME]
{REGULAR} EXAMINATION, NOVEMBER 2024

B.Tech. (2024 Scheme)

CH 24 103 A—ENGINEERING CHEMISTRY

Time : Three Hours Maximum : 100 Marks

Part A

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

I. 1 Explain the mechanical properties of polymers.

2 Distinguish single and multi-walled carbon nanotubes ?

3 What are polymer composites ? Explain the preparation of carbon fibre.

4 What is boiler feed water ? Explain the scale and sludge formation in boiler.

5 Explain Temporary hardness and permanent hardness.

6 What is meant by Caustic embrittlement ?

7 Differentiate solid, liquid and gaseous fuels.

8 What is reformation of petrol ? Write the reactions involved in it.

9 Explain the effect of octane number on the performance of gasoline fuel.

10 Write a note on Helmholtz-Double layer.

11 State about EMF of an electrochemical cell.

12 What is Electrochemical series and give its applications.

13 Explain the electrochemical theory of corrosion taking iron as corroding metal.

14 Explain the mechanism of differential aeration corrosion.

15 Discuss anodizing of aluminium and sacrificial anodic methods of corrosion control.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **all** *questions.*

II. 1 Classify the conducting polymers and the mechanism of conduction on them in detail

Or

2 Describe the Properties and Applications of carbon nanotubes

3 Explain the process of Determination of hardness by EDTA method in detail.

Or

4 Elaborate the process of purification of water for domestic use.

5 Explain Bergius process for preparation of synthetic petrol.

Or

6 How will you determine the calorific value of fuel by using Bomb calorimeter? Explain with the help of a picture

7 Derive Nernst equation for EMF of a cell. Mention its applications.

Or

8 Explain the working of a Ni-Cd and Li cells.

9 Discuss how designing and selection can protect from corrosion.

Or

10 Describe the Corrosion control by cathodic protection.

(5 × 10 = 50 marks)

D 123875 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 405—MANUFACTURING PROCESS—I

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the advantages and limitations of the casting process.
2. What are the different types of pattern allowances ? Explain their significance.
3. List and explain the essential requirements of moulding sand.
4. Compare Sand casting and Investment casting.
5. Describe the Slush Casting process with applications.
6. What are the common casting defects ? Explain briefly.
7. What are the classifications of welding processes ?
8. Explain the concept of weldability and factors affecting it.
9. Differentiate between Gas welding and Arc welding.
10. Explain the principle of Resistance welding.
11. What are the applications of Ultrasonic welding ?
12. What is the role of gases in welding processes ?
13. Define Brazing and Soldering. Differentiate between the two.

Turn over

14. Explain the concept of adhesive bonding and its applications.

15. What is diffusion bonding ? List its advantages and limitations.

(10 × 5 = 50 marks)

Part B

Answer the following questions.

16. Discuss in detail the steps involved in the casting process.

Or

17. Explain directional solidification in castings and its importance.

18. Explain the working principle of Pressure Casting with neat sketches.

Or

19. Describe the Centrifugal Casting process with its advantages and applications.

20. Discuss various non-destructive testing methods used for casting inspection.

Or

21. Explain the classification of arc welding processes with examples.

22. Describe the numerical calculation of different welding process parameters.

Or

23. Explain the working of Plasma and Laser Beam welding with applications.

24. Discuss the various types of brazing fluxes and their importance.

Or

25. Explain surface energy and contact angle in adhesive bonding.

(5 × 10 = 50 marks)

D 123875 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 405—MANUFACTURING PROCESS—I

Time : Three Hours Maximum : 100 Marks

Part A

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Each question carries 5 *marks.*

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Turn over

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23. Explain the working of Plasma and Laser Beam welding with applications.

24. Discuss the various types of brazing fluxes and their importance.

Or

25. Explain surface energy and contact angle in adhesive bonding.

(5 × 10 = 50 marks)

D 123879 **(Pages : 3)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Printing Technology

PT 19 405—ELECTRICAL DRIVES AND CONTROL

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain how an SCR functions as a switch in electrical circuits.
2. What are the different operating modes of a MOSFET ?
3. Define holding current and latching current in the context of a thyristor.
4. Provide the output waveforms for a 1-phase AC voltage controller with a resistive load.
5. List the key applications of cycloconverters in electrical systems.
6. Derive the expressions for output voltage and current of an AC voltage controller with an RL load.
7. What are the advantages and disadvantages of a load-commutated DC chopper ?
8. Explain the operation of a step-up chopper with a schematic diagram.
9. Derive the expression for output voltage in terms of duty cycle for a step-down chopper.
10. Why is load equalization important in electrical drives ?
11. Write a brief note on the sources used in electrical drives.
12. What factors influence the size and rating of a motor used as a drive element ?
13. Explain the concept of V/F control in three-phase induction motors.
14. What is voltage control in induction motors, and where is it applicable ?
15. How does increasing rotor resistance affect the starting performance of a three-phase induction motor ?

(10 × 5 = 50 marks)

Turn over

Part B

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

16. (a) Explain the operation of an IGBT with a structural diagram and waveforms.

    (b) Describe the construction, operation, characteristics, and applications of power transistors.

Or

17. Describe the structure and static characteristics of Silicon Controlled Rectifier (SCR), Power MOSFET, and IGBT. Compare their voltage and current ratings, switching speeds, and conduction losses with appropriate diagrams.

18. (a) Describe the operation of a single-phase full-wave AC voltage controller with voltage and current waveforms.

    (b) Explain the working of a 1-phase to 1-phase mid-point cycloconverter with a circuit diagram and waveforms.

Or

19. Explain the operation of a single-phase full-wave AC voltage controller with resistive load. Draw the circuit diagram and sketch the output voltage waveforms for firing angles of 45° and 120°. Derive the expression for RMS output voltage as a function of firing angle.

20. (a) Describe the different types of chopper configurations with diagrams.

    (b) Explain the chopper control techniques for separately excited DC motors and DC series motors.

Or

21. Describe the circuit topology and operating principle of a four-quadrant DC chopper. Illustrate with waveforms how it achieves four-quadrant operation and derive the expressions for average output voltage in each quadrant of operation.

22. (a) Explain the thermal model of an electric motor for heating and cooling, and discuss continuous, short-time, and intermittent duties.

    (b) Explain the transient stability of an electric drive and how it can be improved. What role does load equalization play ?

Or

23. Describe four-quadrant operation of electric drives with appropriate diagrams showing the relationship between torque and speed in each quadrant. For a typical industrial application such as a hoist or crane, explain which quadrants are utilized during different parts of the operational cycle and the energy flow in each case.

24. (a) Explain the slip power recovery scheme for controlling the speed of an induction motor using a static Kramer drive.

(b) Discuss the principle of speed control for induction motors above and below synchronous speed by feeding energy to the source.

Or

25. Compare and contrast the slip-power recovery schemes used in 3-phase induction motor drives, specifically the static Kramer drive and static Scherbius drive. Explain with circuit diagrams how each system recovers slip power and enables speed control. Analyze their respective speed ranges, power flow during motoring and regenerative braking, and overall efficiency.

(5 × 10 = 50 marks)

D 123883 **(Pages : 3)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 405—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

I. 1 Determine whether the given signal is Energy Signal or power Signal. And calculate its energy or power, $(t) = e–2t\ (t)$.

2 Illustrate the condition for BIBO stability.

3 Explain the Conditions for a System to be LTI System ?

4 Write the equations for trigonometric and exponential Fourier series.

5 Using Fourier transform property, determine the Fourier transform of $x\ (t) = x\ (4t – 8)$.

6 State the properties of power spectral density.

7 Find the Fourier transform of the signal $x\ (t) = \delta\ (t)$ also sketch the magnitude and phase spectrum.

8 Write the properties of CT Fourier Transform.

9 Analyze the Relationship between Laplace Transform and Fourier Transform.

10 Find the DTFT of $x\ (n) = \{1, 1, 1, 1, 1, 1, 0, 0\}$.

11 State Parseval's relation for discrete time aperiodic signals

12 State the sufficient condition for the existence of DTFT for an aperiodic sequence ?

Turn over

13 State and prove the convolution and scaling properties of z-transform.

14 Estimate the inverse Z-transform for the following sequences.

$$X(Z) = 3Z^2 + Z + 2 - 3Z^{-1} + 2Z^{-2}$$

15 Relate DTFT and Z transform with necessary explanations.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

II. (1) (i) Identify whether the following systems are linear or not.

(a) $y(t) = x^2(t)$

(b) $y[n] = 3x[n] + 1/x[n-1]$

(ii) Distinguish between continuous time signal and discrete time signal.

Or

(2) Examine whether the following systems are static or dynamic and time invariant or time variant.

(i) $y(n) = x(n) - x(n-1)$.

(ii) $y(t) = d/dt\ x(t)$.

(3) (i) Find out the Fourier transform of $x(t) = e - \text{at}\ u(-t)$.

(ii) Determine the Fourier series representation of the signal $x(t) = 2 + \cos(4t) + \sin(6t)$.

Or

(4) Find the Fourier Transform of Rectangular pulse. Sketch the signal and Fourier transform.

(5) Estimate the convolution of two signals $x1(n) = (1/2)\ n\ u(n)$ and $x2(n) = (1/4)\ n\ u(n)$ using DTFT.

Or

(6) Derive the Laplace Transform and ROC of the signal $x(t) = e{-}3tu(t) + e{-}2tu(t)$.

7. (i) Find the DTFT of $x(n) = \delta(n) + \delta(n-1)$.

   (ii) Find the DTFT of $x(n) = 3n\,u(n)$ and $x(n) = (3)\,n\,u(-n)$.

Or

8. Prove the sampling theorem and explain how the original signal can be reconstructed from the sampled version with necessary illustration.

9. Determine the Z transform and ROC of $x(n) - u(-n) - u(n-3)$.

Or

10 Find the inverse Z Transform of $X(z) = 1/\{1 - 0.5z - 1 + 0.5z - 2)$ for ROC $|Z| > 1$.

(5 × 10 = 50 marks)

D 123887 **(Pages : 3)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 405—ANALOG CIRCUITS

Time : Three Hours Maximum : 100 Marks

(*Give sketches wherever necessary*).

Part A

Answer any **ten** *questions.*

1. Explain large signal operation of MOS differential amplifier.
2. Enumerate the methods to improve CMRR. Explain any *one* method in detail.
3. With necessary diagrams, derive an expression for input/output resistance for a CS differential amplifier.
4. Draw an inverting amplifier using an op-amp and derive the expression for its closed loop voltage gain.
5. What is meant by Offset voltage in an op-amp ? Explain its significance in circuit performance.
6. Define Slew rate. Explain its role in circuit design.
7. State and explain Barkhausen criteria for sustained oscillations.
8. Derive an expression for f_o in a RC phase shift oscillator.
9. Draw the circuit and frequency response of second order LCR resonator
10. Analyze the Inverted or Current mode R-2R Ladder Digital to Analog converter.
11. Draw the circuit and explain the working of dual slope A/D converter.
12. Design a 9 volt negative power supply using a fixed regulator. Output current is 500 ma.
13. Illustrate the operation of VCO with neat block diagram.

Turn over

14. With a circuit, explain the operation of a FSK Detector.

15. Draw the internal diagram of IC 555 and give functions of each block.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

16. (a) Derive CMRR, input resistance and output resistance of a dual input balanced output differential amplifier configuration.

(5 marks)

(b) How a constant current bias circuit can be used to improve the CMRR of a differential amplifier ?

(5 marks)

Or

17. (a) Analyse the differential amplifier circuit using BJT and derive an expression for differential mode gain and common mode gain.

(5 marks)

(b) Draw the circuit diagram of a Wilson current source and derive an expression for output current in terms of the reference current.

(5 marks)

18. Draw the circuit diagram of Instrumentation amplifier and explain its operation. List few of its applications.

(10 marks)

Or

19. Illustrate the operation of current to voltage and Voltage to current converter circuits.

(10 marks)

20. With circuit diagram and design equations, explain the working of a mono stable multivibrator.

(10 marks)

Or

21. Draw a general Sallen-Key Filter and determine its transfer function and from general Sallen Key Filter, obtain the transfer function of second order active low pass filter. Draw second order active low pass filter.

(10 marks)

22. With necessary diagrams, explain the principles of a Delta ADC. (10 marks)

Or

23. Draw and Explain the functional block diagram of the LM-317 three terminal adjustable regulator.

(10 marks)

24. With a block diagram explain the working of PLL and derive the expression for Lock range and capture range.

(10 marks)

Or

25. With necessary circuit diagrams, explain the function of 555 timer in astable multivibrator and derive the expression for frequency of oscillation.

(10 marks)

[5 × 10 = 50 marks]

D 123891 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Information Technology

IT 19 405—OBJECT ORIENTED PROGRAMMING USING JAVA

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Distinguish between Procedure Oriented Programming and Object Oriented Programming.
2. Explain the different types of variables used in Java.
3. List out the types of operators used in Java.
4. Write short notes on static methods.
5. Specify the different access specifiers in Java.
6. Explain the need for Java Doc multiline comments.
7. What is an Interface ? Mention the rules to create an interface in java with example.
8. Elaborate the mechanism of object cloning in Java.
9. What is reflection API ? How are they implemented ?
10. Highlight the states in the lifecycle of a thread.
11. Enumerate the advantages of multithreading.
12. Mention the features of Applets and state its advantages and disadvantages.
13. Differentiate ResultSet and Rowset in JDBC.
14. Give a brief note on transaction management in JDBC.
15. Explain the mechanism of Remote Method Invocation (RMI) in Java.

(10 × 5 = 50 marks)

Turn over

Part B

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

16. a) Given two one dimensional arrays A and B which are sorted in ascending order. Write a Java program to merge them into a single sorted array, see that is contains every item from array A and B, in ascending order.

Or

b) Illustrate the usage of loop statements in Java with examples.

17. a) Write a program to perform the following functions using classes, objects, constructors and destructors where essential. Get as input the marks of 5 students in 5 subjects. Calculate the total and average and print the formatted result on the screen.

Or

b) With suitable examples explain how packages can be created, imported and used. Also elaborate on its scope.

18. a) Illustrate the concept of multilevel and hierarchical inheritance with Java program.

Or

b) Write a java Program to read a text file and print the number of unique words.

19. a) Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.

Or

b) Discuss the significance of JAR files in Java.

20. a) Describe the architecture of JDBC with a neat diagram.

Or

b) Discuss about parameter passing methods in RMI with examples.

(5 × 10 = 50 marks)