

Roll No. _____

[Total No. of Pages : 2]

2E3201

2E3201

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY2-01 Engineering Mathematics - II

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates:**

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given upto 25 Words Only)

All questions are compulsory.

(10×2=20)

1. Find the solution of the differential equation:

$$(D - 3)^3 y = 0; \text{ where } D = \frac{d}{dx}.$$

2. The nullity of matrix $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 4 & 8 \\ 4 & 8 & 16 \end{bmatrix}$ is?

3. Write an example of Bernoulli's differential equation.

4. Write the degree of the differential equation $\left(\frac{d^2 y}{dx^2}\right)^2 - \left[4x + \left(\frac{dy}{dx}\right)^2\right]^4 = 0$.

5. Check whether the differential equation $(x^2 - 2y)dx - (2x - y^2)dy = 0$ is exact or not.

6. Classify the following partial differential equation:

$$x \frac{\partial^2 z}{\partial x^2} + 5 \frac{\partial^2 z}{\partial x \partial y} + y \frac{\partial^2 z}{\partial y^2} + 5 \frac{\partial z}{\partial y} = 0.$$

7. Find the solution of DE $y = px + \operatorname{cosec}(1 + 2p)$.

8. Find the solution of the differential equation:

$$\frac{dx}{y} = \frac{dy}{x} = \frac{dz}{z}$$

9. State Caley-Hamilton Theorem.
10. Write Charpit's Auxiliary equation for the solution of first order partial differential equations.

PART - B

(Analytical/Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Demonstrate the rank of matrix $A = \begin{bmatrix} 1 & 2 & 8 & 5 \\ 0 & 4 & 6 & 3 \\ 0 & 0 & -1 & 0 \\ 1 & 2 & 2 & 2 \end{bmatrix}$.
2. Identify the consistency of the system of linear equation $x + y + z = 0$, $2x + y + z = 0$, $3x + 2y = 4$.
3. Find the solution of differential equation $(x^2 D^2 y - x Dy - 2y) = 0$.
4. Solve the following differential equation $(x^2 y^2 + xy + 1) y dx + (x^2 y^2 - xy + 1) x dy = 0$.
5. Find the solution of the following PDE: $(xy - zx)p + (yz - xy)q - (xz - yz) = 0$.
6. Using the method of separation of variables, solve

$$\frac{\partial z}{\partial x} = 2 \frac{\partial z}{\partial y}, \text{ where } z(x, 0) = 6e^{-3x}.$$

7. Find the C.F. of DE $\frac{d^4 y}{dx^4} - 81y = \cosh 3x$.

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any Three questions.

(3×10=30)

1. Diagonalize the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$.
2. Find the solution of differential equation $xp^2 - 2yp + x = 0$.
3. Find the complete integral of given P.D.E. $px + qy = pq$ by Charpit's method.
4. Find the Solution of differential equation $(D^2 - 3D + 2)y = \sin 3x + x^2 + x + e^{4x}$.
5. Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ which satisfies the conditions

$$u(0, y) = u(l, y) = u(x, 0) = 0 \text{ and } u(x, a) = \sin \frac{n\pi x}{l}.$$

Roll No. _____

[Total No. of Pages : 2]

2E3202

2E3202

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY2-03/Engineering Chemistry

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates:**

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Define Scale and Sludge.
2. What is Zeolite?
3. What is Coke?
4. What is meant by calorific value of a fuel?
5. What is steam emulsion number of a lubricant?
6. Define cement with its composition.
7. What is annealing of glass?
8. What is the chemical formula of rust?
9. Define Flash and Fire point of a lubricant.
10. Define Drugs and give its uses.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. A Sample of water was analysed and found to contain temporary magnesium hardness 25 mg/l, permanent magnesium chloride hardness 15 mg/l and permanent calcium sulphate hardness 20 mg/l, $\text{SiO}_2 = 200 \text{ mg/l}$. Calculate the lime and soda required for softening 30,000 litre hard water.
2. Calculate the gross and net calorific value of a coal sample having the following composition: C = 80%, H = 7%, O = 3%, S = 3.5%, N = 2.1% and ash = 4.4%.

3. Explain thick layer mechanism of Lubrication.
4. Explain the sacrificial anodic method to minimize corrosion.
5. Describe Fisher-Tropsch method of preparing synthetic petrol.
6. Explain the mechanism of free-radical substitution reaction with suitable example.
7. What is glass? How is it manufactured? (1+3=4)

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. What is water softening? Describe water softening by De-mineralization process with diagram. (2+8=10)
 2. What is carbonization of coal? Describe Otto-Hoffmann by product oven method of carbonization for the manufacturing of coke. (2+8=10)
 3. What is cement? Describe cement manufacturing by rotatory Kiln technology with diagram and reaction involved in the process. (2+8=10)
 4. What is corrosion? Describe the mechanism of electrochemical corrosion by hydrogen evolution and oxygen absorption. (2+8=10)
 5. What is paracetamol drug? Describe the synthesis, properties and uses of paracetamol. (2+8=10)
-

2E3203	Roll No. _____	[Total No. of Pages : 2]
	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">2E3203</div> <p>B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025 2FY2-02 Engineering Physics</p>	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Discuss Haidinger Fringes.
2. Distinguish between Fresnel's and Fraunhofer's diffraction.
3. What do you mean by Quantum Mechanics?
4. Define wave-particle duality and matter waves.
5. Distinguish between Spatial and Temporal coherence.
6. Define visibility as a measure of coherence and spectral purity.
7. Define population inversion and pumping of laser.
8. What do you mean by intrinsic and extrinsic semiconductors?
9. Write the differential form of Maxwell equations.
10. Give the importance of displacement current.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. A plane transmission grating produces an angular separation of 0.01 radian between two wavelengths observed at an angle of 30°. If the mean value of the wavelength is 5000Å and the spectrum is observed in the second order, calculate the difference in the two wavelengths.

2. The hall voltage for the sodium metal is 0.001 mV, measured at $I = 100$ mA, $B = 2$ Tesla, the width of the specimen = 0.05 mm and $\sigma = 2.09 \times 10^7 \Omega^{-1}\text{m}^{-1}$, (a) calculate the number of carriers per cubic meter in sodium and (b) calculate the mobility of electrons in sodium.
3. When a thin film of mica of refractive index 1.6 is interposed in the path of one of the interfering beams of the Michelson's interferometer, a shift of 50 fringes of sodium light is observed across the field of view. If the thickness of the air film is 0.02 mm. Calculate the wavelength of the light used.
4. Calculate the value of pointing vector and the amplitude of the electric field if a laser beam of 500W is concentrated using a bust on a cross-section area of 10^{-10} M^2 .
Given $E_0 = 9 \times 10^{-12} \text{ F/M}$.
5. White light has wavelengths from 0.4 μm to 0.8 μm . Determine its coherence length, coherence time and Q value.
6. Find the probability that a particle trapped in a box L cm wide can be found between 0.45L and 0.55L for the ground and first excited state.
7. A glass clad fiber is made with core glass of refractive index 1.5 and the cladding is doped to give a fractional index difference of 0.0005. Calculate: (a) the cladding index (b) the critical internal reflection angle (c) the external critical acceptance angle (d) the numerical aperture.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. a) Give a difference between the fringes produced with the help of Newton's rings and Michelson's interferometer. (3)
b) Discuss the formation of Newton's rings by (i) reflected light and (ii) transmitted light. Derive an expression for the diameter of n^{th} dark ring in reflected light. (7)
2. a) Describe the construction and working of a semiconductor laser. (5)
b) Define acceptance angle and numerical aperture. Derive their expression. (5)
3. a) What is poynting vector? How is the Poynting theorem derived from Maxwell equations? Explain Poynting theorem. (7)
b) Show that the gradient of a scalar function at any point is directed normally to the surface in the scalar field over which the value of the scalar function is constant. (3)
4. a) Give physical significance of wave function. Derive time dependent Schrodinger wave equation. (7)
b) Define Hall Effect and Hall Coefficient. (3)
5. a) Write down Schrodinger's equation for a particle of mass m trapped in three dimensional box. Solve it for energy Eigen values and Eigen function. (6)
b) Explain Fermi Dirac distribution function and Fermi Energy. (4)

126181

Roll No. _____

[Total No. of Pages : 2]

2E3204

2E3204

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY1-05 Human Values

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates:**

Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A**(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. State the meaning of human values.
2. What do you mean by Natural Acceptance?
3. What is the meaning of Harmony?
4. How should state of happiness be defined?
5. What do the abbreviations SVDD, SSDD, and SSSS signify?
6. What do you mean by Sanyam (self-regulation) and Svasthya (Health)?
7. What do you mean by Justice?
8. What is the comprehensive human goal?
9. What is the difference between wealth and prosperity?
10. What does holistic technology means?

PART - B**(Analytical / Problem Solving Questions)****Attempt any Five questions.****(5×4=20)**

1. Explain the feelings of care, glory and gratitude.

2. Briefly discuss the concept of self-exploration.
3. What is the need for value education in technical institutions?
4. Discuss the activities in the four orders of nature.
5. Differentiate between animal consciousness and human consciousness.
6. Suggest any two programs that you can follow to improve the health of your body.
7. Discuss the problems that we face today due to pre-condition desires, thoughts and selections.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. "I" is a conscious unit while "body" is a material unit. Discuss.
 2. Family is the basic unit of human interaction. Discuss.
 3. Activities of imaging (desire), analysing (thoughts) and selecting/tasting (expectation) are constantly taking place in "I". Discuss.
 4. The units are in co-existence being in space. Explain.
 5. Critically examine the issues in professional ethics in the current scenario.
-

Roll No. _____

[Total No. of Pages : 2]

2E3205**2E3205**

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY1-04 Communication Skills

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates:**

Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A**(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. What is downward communication?
2. Mention any two qualities of good communication.
3. Give an example of conditional sentence.
4. What is the difference between Active voice and Passive voice?
5. What is a 'Paragraph'?
6. Mention any two types of reports.
7. What is 'Luncheon'?
8. What was it that Pahom wanted more of?
9. What is the central theme of the poem 'No Men are Foreign'?
10. What is the poem "If" by Rudyard Kipling about?

PART - B**(Analytical / Problem Solving Questions)****Attempt any Five questions.****(5×4=20)**

1. What are the barriers to Communication?
2. What is non-verbal communication?
3. Complete these sentences by using the correct tenses. Hints are given to complete the sentences:
 - a) If I earn more money _____. (purchase a bigger house)
 - b) If we drive carefully _____. (save other's lives)
 - c) If I had gone to England _____. (visit London)
 - d) Had the picture hall not been full _____. (get tickets)

4. Write a paragraph on 'Education for all _____ is it still a dream for Indians'?
5. Why does the author agree to take the lady for Luncheon?
6. Give central theme of the story "The Night Train at Deoli".
7. How does the poet suggest that all people on earth are the same?

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. What is verbal communication? Discuss its advantages and disadvantages.
 2. What are modal verbs? Discuss their usages with examples.
 3. "Do our educational institutions encourage creativity"? Give your views in the form of an analytical report.
 4. Write a note on the inherent weakness in the character of Pahom.
 5. Write the summary of the poem, "Where the Mind is Without Fear"
-

2E3206

Roll No. _____

[Total No. of Pages : 2]

2E3206

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY3-07 Basic Mechanical Engineering

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates:**

Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. What is meant by superheated steam?
2. List the main mountings of boiler.
3. What is the basic difference between reciprocating and centrifugal pump?
4. List the main components of an IC engine.
5. Define speed ratio in case of simple gear train.
6. Define Ton of Refrigeration.
7. What are the aims of pre-heating of air in a boiler?
8. Explain four basic functions of electrode in welding.
9. Define pattern in metal casting.
10. What is the percentage of carbon in low, medium and high carbon steels?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Briefly write the working principle of a steam power plant with diagram.
2. Explain the working of Impulse turbine with neat sketch.

3. Explain the molding process with list of tools used in the process.
4. Explain the arc welding with functions of important components used in the process.
5. Briefly explain about major types of gears with their applications.
6. What is refrigerant? Describe the important properties of a good refrigerant.
7. What are the common stages and main objectives of heat treatment process? Explain in brief.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. Explain the formation of steam with a graph. Describe the working of Cochran boiler with neat and labelled diagram.
 2. Explain the working of centrifugal pump with sketch. Why priming is important in centrifugal pump and how it is done?
 3. Classify the different types of IC engine. Explain the working of 4-stroke Diesel engine with neat sketch. Also compare it with 4-stroke petrol engine.
 4. Explain vapour compression refrigeration system with neat sketch.
 5. Write short note on any two:
 - a) Soldering process.
 - b) Hardening heat treatment.
 - c) Two stroke petrol engine.
 - d) Open belt drive.
-

Roll No. _____

[Total No. of Pages : 2]

2E3206**2E3206**

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY3-07 Basic Mechanical Engineering

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates:**

Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.**(10×2=20)**

1. What is meant by superheated steam?
2. List the main mountings of boiler.
3. What is the basic difference between reciprocating and centrifugal pump?
4. List the main components of an IC engine.
5. Define speed ratio in case of simple gear train.
6. Define Ton of Refrigeration.
7. What are the aims of pre-heating of air in a boiler?
8. Explain four basic functions of electrode in welding.
9. Define pattern in metal casting.
10. What is the percentage of carbon in low, medium and high carbon steels?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.**(5×4=20)**

1. Briefly write the working principle of a steam power plant with diagram.
2. Explain the working of Impulse turbine with neat sketch.

3. Explain the molding process with list of tools used in the process.
4. Explain the arc welding with functions of important components used in the process.
5. Briefly explain about major types of gears with their applications.
6. What is refrigerant? Describe the important properties of a good refrigerant.
7. What are the common stages and main objectives of heat treatment process? Explain in brief.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. Explain the formation of steam with a graph. Describe the working of Cochran boiler with neat and labelled diagram.
 2. Explain the working of centrifugal pump with sketch. Why priming is important in centrifugal pump and how it is done?
 3. Classify the different types of IC engine. Explain the working of 4-stroke Diesel engine with neat sketch. Also compare it with 4-stroke petrol engine.
 4. Explain vapour compression refrigeration system with neat sketch.
 5. Write short note on any two:
 - a) Soldering process.
 - b) Hardening heat treatment.
 - c) Two stroke petrol engine.
 - d) Open belt drive.
-

141865

2E3207

Roll No. _____

[Total No. of Pages : 2]

2E3207

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY3-06 Programming for Problem Solving

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answers should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Give two examples of primary memory devices.
2. Why are high-level languages considered easier to use than low-level languages?
3. What is a flowchart in the context of algorithm representation?
4. Perform binary subtraction using 2's complement: 1010-0101.
5. Find the (r-1)'s complement of the binary number 100110.
6. List any four basic data types used in C.
7. Differentiate between *while* and *do-while* loops in C.
8. What is a function in C and why is it used?
9. How is a pointer different from a regular variable?
10. How do you open and read a file in C?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.

(5×4=20)

1. Classify the following devices as Primary and Secondary storage: RAM, Hard Disk, SSD, Cache, ROM. Explain your classification.

2. Explain how the ASCII representation is used to store alphabets in memory. Give binary for the character 'A'.
3. You are given a number in radix 4: 1321_4 . Convert it to decimal and then to binary.
4. Write a C program using a for loop to print the first 10 Fibonacci numbers.
5. Write a function that takes an array and its size as arguments and returns the maximum value using pointers.
6. Given a number, check if it is a palindrome using functions and logical operations.
7. Write a C program to count the number of vowels in a given string using a switch statement.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. Why is RAM considered volatile memory while ROM is non-volatile? What implications does this have for computer performance and functionality?
 2. Design a simple algorithm (in pseudo code or flowchart) for an ATM system that allows withdrawal, deposit, and balance inquiry.
 3. Compare and contrast the number systems with radix 2, 8, 10, and 16 in terms of ease of use, conversion, and storage efficiency.
 4. Write a C program to input 10 integers into an array and count how many are positive, negative, and zero.
 5. Develop a C program that reads data from one file and writes only the vowels into another file.
-

Roll No. _____

[Total No. of Pages : 2]

2E3208**2E3208**

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY3-09 Basic Civil Engineering

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates:**

Attempt All Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A**(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. How geodetic survey is differed from plane survey?
2. What are the two basic principles of surveying?
3. Explain "Plinth Area" and "Carpet Area".
4. Discuss the difference between "Plan" and "Map".
5. What do you understand by "Building Line" and "Control Line"?
6. What are the causes and effects of air and noise pollution?
7. Draw the traffic symbols for "No U-Turn" and "No Overtaking".
8. What are the basic components of a building?
9. Write one unique advantage of road transport compared to the other modes of transportation.
10. What are the various instruments used in chain surveying?

PART - B**(Analytical / Problem Solving Questions)****Attempt any Five questions.****(5×4=20)**

1. What is the principle of compass surveying? Tabulate the differences between Prismatic Compass and Surveyor Compass.

2. What are the objectives of building bye laws? What is the advantage of set-back?
3. What is the difference between a shallow foundation and a deep foundation and when would each type be used?
4. The measured distance from 'A' to 'B' is 320m. The steel tape used has a standard length at 20°C with a coefficient of thermal expansion of 0.0000065/°F. The corrected distance between 'A' to 'B' is 320.103m. Find the temperature during measurement.
5. Explain the carbon, nitrogen, and phosphorus cycles. How do these chemical cycles contribute to maintaining ecosystem stability?
6. Discuss the relevance of civil engineering in the infrastructure development of the country.
7. Convert the following reduced bearings (RB): (a) N 42° 30' E; (b) S 32° 40' E; (c) S 50° 30' W; (d) N 62° 50' W; (e) S 48° 45' W to whole circle bearings (WCB).

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. What are the general causes of road accidents? What are the important traffic rules to follow for ensuring safety while driving?
2. What is the difference between self-reading staff and target staff? Write detail note on EDM distance measurement methods.
3. What is the difference between Magnetic Bearing and True Bearing? The bearing of line AB is 196° and that of line CB is 256°45'. Find the included angle ABC.
4. What are the different scopes of civil engineering? Write detailed note on the role of a civil engineer in society.
5. The following consecutive readings were taken with a dumpy level -

Points	P	I ₁	I ₂	Q
B.S (m)	2.365	0.685	1.745	
F.S. (m)		1.235	3.570	2.340

RL of "P" is 100m find RL of "I₁", "I₂", and "Q" using the Rise and Fall method.

Roll No. _____

[Total No. of Pages : 2]

2E3209**2E3209**

B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025
2FY3-08 Basic Electrical Engineering

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates:**

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.**(10×2=20)**

1. State Kirchoff's Current Law (KCL) and Kirchoff's Voltage Law (KVL)
2. What is the difference between Active and Passive circuit elements.
3. Define real power, reactive power, Apparent Power and Power factor.
4. What is voltage regulation in a transformer, Also define the efficiency of it.
5. What is the difference between an Induction motor and a synchronous motor.
6. What is a power converter. Also provide the purpose of an Inverter.
7. Differentiate MCB and MCCB.
8. A sinusoidal AC voltage has a peak value of 230 V calculate "Form Factor"
9. Two resistors of 8Ω and 12Ω are connected in parallel across 24V supply find current through each resistor.
10. What is the significance of Back EMF in a DC motor.

PART - B

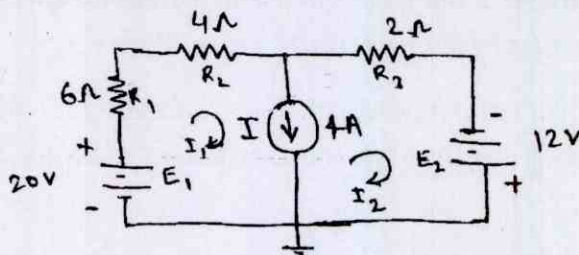
(Analytical / Problem Solving Questions)

Attempt any Five questions.**(5×4=20)**

1. Derive and explain the maximum power transfer theorem.

(4)

2. Derive the EMF equation of a transformer, Also discuss the equivalent circuit of it. (4)
3. Explain the construction and working three phase Induction motor. (4)
4. Explain the operation and Basic circuits of single phase rectifier with R Load. (4)
5. Explain the importance of proper earthing in electrical installations. Also Discuss the different methods of earthing. (4)
6. A 100 V, 50 Hz Ac supply is connected to a series combination of a 10Ω resistor, $0.2H$ Inductor and $50\mu F$ capacitor find :
 - a) Impedance of the circuit
 - b) Current flowing in the circuit
 - c) Voltage across each component. (4)
7. Using the mesh analysis determine the current of the network. (4)



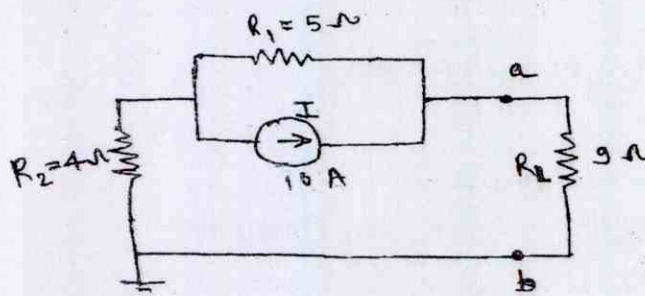
PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

1. A factory operates at 250V, 50Hz drawing 50A with a power factor of 0.7 lagging. Calculate the capacitance required to improve the power factor to 0.9. (10)
2.
 - a) Explain the speed control methods of Induction motor.
 - b) Explain the construction and working of synchronous generator. (5+5)
3.
 - a) Explain the working of DC-DC converter.
 - b) Explain the characteristics and applications of SCR. (5+5)
4. Write short note on:
 - a) Losses in transformer
 - b) Elementary calculations for energy consumption. (5+5)
5. Find the Norton equivalent circuit for the network external to the 9Ω Resistor. As in given figure. (10)



2E2401

Roll No. _____

[Total No. of Pages : 3]

2E2401**B.Tech. II-Sem. (Back) Examination, May/June - 2025****BSC****2FY2-01 Engineering Mathematics - II****Time : 3 Hours****Maximum Marks : 160****Instructions to Candidates:**

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Four questions out of Five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART-A**(Answer should be given up to 25 words only)****All questions are compulsory.****(10×3=30)**

1. Find the rank of matrix A:

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix}$$

2. State the rank-nullity theorem.

3. For a given linear differential equation of first order $\cos^2 x \frac{dy}{dx} + y = \tan x$; Find the integrating factor (I.F).

4. Solve: $P^2 - 9P + 18 = 0$

5. Find the complementary function (C.F.) of differential equation.

$$(D^2 + 3D + 2)y = e^x; D \equiv \frac{d}{dx}$$

6. Write the Legendre differential equation.

7. Solve the partial differential equation (Lagrange form) $yzp + zxq = xy$

8. Find the complete integral of partial differential equation: $z = px + qy + pq$.

9. Classify the following partial differential equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$.
10. Write the one dimensional heat equation.

PART - B

(Analytical/Problem Solving questions)

Attempt any Five questions.

(5×10=50)

1. Reduce the given matrix into normal form and hence find the rank.

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

2. Examine the consistency for following equations and solve them if they are consistent.

$$x + y + z = 6$$

$$2x + y + 3z = 13$$

$$5x + 2y + z = 12$$

$$2x - 3y - 2z = -10$$

3. Solve the following exact differential equation of first order:

$$(x^2 y^2 + xy + 1)y \, dx + (x^2 y^2 - xy + 1)x \, dy = 0$$

4. Solve: $(D^2 + 1)y = e^{-x} + \cos x + x^3$

5. Find the power series solution of $(2 - x^2) \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} - 2y = 0$

6. Find the complete integral of the partial differential equation:

$$9(P^2 z + q^2) = 4$$

7. Apply separation of variables method to solve two dimensional laplace equation and write general solution.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Four questions.

(4×20=80)

1. Verify cayley Hamilton theorem for matrix. $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ and hence find A^{-1}

2. Solve : $y=2px+y^2p^3$.

3. Solve by the method of variation of parameters. $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - y = x^2 e^x$.

4. Find the complete integral by charpit's method for partial differential equation

$$2xz - px^2 - 2qxy + pq = 0.$$

5. Solve the following by the method of separation of Variables: $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$; Satisfying

the conditions: $u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = \sin \frac{\pi x}{l}$.
