

1E3101

Total No. of Questions : 22

Total No. of Pages : 04

Roll No. : .....

1E3101

B.Tech. I sem(Main/Back) Exam 2024

1FY2-01 / Engineering Mathematics-I

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)*

1. ....

2. ....

**PART - A**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. What is the value of integral  $\int_0^{\infty} e^{-x^2} dx$  ?

Q.2. Write the formula of surface area of solid of revolution when the revolution is about x-axis.

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Q.3. What do you mean by convergence of a sequence?

Q.4. Find whether the following series is convergent or not?

$$\frac{1}{2.3} + \frac{1}{3.4} + \frac{1}{4.5} + \dots$$

Q.5. State Parseval's theorem.

Q.6. Find the value of  $a_0$  for the function  $f(x) = |x|$  in the interval  $(-\pi, \pi)$ .

Q.7. State the necessary and sufficient conditions for the minimum of a function  $f(x, y)$ .

Q.8. Find the gradient of  $f(x, y, z) = x^2y^2 + xy^2 - z^2$  at  $(3, 1, 1)$ .

Q.9. Evaluate  $\int_0^b \int_0^x xy \, dx \, dy$ .

Q.10. State the Gauss Divergence theorem.

### PART - B

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Use beta and gamma functions, to evaluate :

$$\int_0^{\infty} \frac{x^2(1+x^4)}{(x+x^2)^{10}} dx.$$

Q.2. Expand  $\sin x$  in the powers of  $(x - \pi/2)$  using Taylor's series.

Q.3. Find Fourier series of  $x^2$  in  $(-\pi, \pi)$ , and use Parseval's identity to prove :

$$\frac{\pi^4}{90} = 1 + \frac{1}{2^4} + \frac{1}{3^4} + \dots$$

Q.4. If  $u = e^{xyz}$ , then show that :

$$\frac{\partial^3 u}{\partial x \partial y \partial z} = (1 + 3xyz + x^2 y^2 z^2) e^{xyz}$$

Q.5. Whether the fluid motion given by  $V = (y+z)\mathbf{i} + (z+x)\mathbf{j} + (x+y)\mathbf{k}$  is incompressible or not?

Q.6. Change the order of integration and hence evaluate :

$$\int_0^1 \int_{e^x}^e \frac{1}{\log y} dx dy.$$

Q.7. Evaluate  $\int_1^2 \int_1^z \int_0^y (xyz) dx dy dz$ .

### PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

Q.1. Use beta and gamma functions, to evaluate :

(a)  $\int_0^{\infty} \frac{x}{1+x^6} dx.$

(b)  $\int_0^1 \sqrt{\left(\frac{1-x}{x}\right)} dx.$

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Q.2. Find the Fourier series expansion of the following periodic function with period  $2\pi$ .

$$f(x) = \begin{cases} -1, & -\pi < x < 0 \\ 0, & x = 0 \\ 1, & 0 < x < \pi \end{cases}$$

Hence, show that  $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots = \frac{\pi}{4}$ .

Q.3. Use Lagrange's method to find the maximum and minimum distance of the point  $(3, 4, 12)$  from the sphere  $x^2 + y^2 + z^2 = 1$ .

Q.4. If  $u = f(r)$ , where  $r^2 = x^2 + y^2$ , then prove that :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r} f'(r).$$

Q.5. Verify Green's theorem for  $\int_C [(xy + y^2)dx + x^2 dy]$ , where  $C$  is the closed curve of the region bounded by  $y = x$  and  $y = x^2$ .

1E3102

Total No. of Questions : 22

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1E3102

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY2-02/Engineering Physics

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)*

1. ....

2. ....

**PART-A**

**[10×2=20]**

**(Answer should be given upto 25 words only)**

**All questions are compulsory**

Q.1. Give the physical significance of divergence and curl of a field.

Q.2. Write all four Maxwell's equations in integral form for free space.

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- Q.3. What do you mean by eigenfunctions and eigen values?
- Q.4. When the movable mirror of Michelson's interferometer is shifted by 0.030 mm, the shift of 100 fringes is observed. Calculate the wavelength of light in  $\text{\AA}$  and state its colour.
- Q.5. State Rayleigh's criterion of resolution.
- Q.6. Find the lowest energy of an electron confined to move in one dimensional potential box of length  $1 \text{\AA}$ .
- Q.7. Calculate the numerical aperture and acceptance angle of an optical fiber. Given refractive index of fiber core=1.62 and refractive index of cladding=1.52.
- Q.8. Define spatial and temporal coherence.
- Q.9. What do you mean by stimulated emission and spontaneous emission?
- Q.10. The carrier concentration in n-type semiconductor  $10^{19}$  per  $\text{m}^3$ . What is the value of Hall coefficient?

**PART-B**

**[5×4=20]**

**(Analytical/Problem solving questions)**

**Attempt any five questions**

- Q.1. Give the construction and theory of plane transmission grating and explain the formation of spectra by it.
- Q.2. Prove that in high frequency region laser action is not possible.
- Q.3. For intrinsic semiconductor with a band gap  $E_g=0.7 \text{ eV}$ , calculate the density of electrons and holes at 300K.

- Q.4. A ray of light enters from air into fiber. The refractive index of air is one. The fiber has a core of refractive index 1.5 and cladding of refractive index 1.48. Find the critical angle, the fractional refractive index, acceptance angle and numerical aperture.
- Q.5. A plane transmission grating of length 6 cm has 5000 lines/cm. Find the resolving power of grating and the smallest wavelength difference that can be resolved for light of wavelength  $5000 \text{ \AA}$ .
- Q.6. If a potential function is given by the expression,  $\phi = xyz$ , determine the potential gradient and also prove that the vector is irrotational.
- Q.7. Calculate the angles at which the first dark band and the next bright band are formed in the Fraunhofer diffraction pattern of a slit 0.3 mm wide ( $\lambda = 5890 \text{ \AA}$ ).

**PART-C**

**[3×10=30]**

**(Descriptive/Analytical/Problem Solving/Design Question)**

**Attempt any three questions**

- Q.1. In a Newton's ring arrangement with air film observed with light of wavelength  $6 \times 10^{-5} \text{ cm}$ , the difference of squares of diameters of successive rings is  $0.125 \text{ cm}^2$ . What will happen to this quantity if:
- (i) Wavelength of light is changed to  $4.5 \times 10^{-5} \text{ cm}$ .
  - (ii) A liquid of refractive index 1.33 is introduced between the lens and the plate
  - (iii) The radius of curvature of the convex surface of the Plano-convex lens is doubled?
- Q.2. Explain the terms : Population inversion and optical pumping. Discuss with suitable diagrams the principle, construction and working of Helium-Neon Laser.

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- Q.3. 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.
  - (b) calculate the mobility of electrons in sodium.
- Q.4. State and prove Poynting theorem for the rate of flow of energy in electromagnetic field. What is Poynting vector?
- Q.5. Give physical significance of wave function. Derive time dependent and time independent Schrödinger wave equation.

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Total No. of Questions : 22

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1E3103

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY2-03/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)*

1. ....

2. ....

**PART-A**

**[10×2=20]**

**(Answer should be given upto 25 words only)**

**All questions are compulsory**

Q.1. Hardness of a given water sample is 250 ppm. Express the hardness in degree Clarke and degree French. [2]

- Q.2. What do you understand by Break Point Chlorination. [2]
- Q.3. The Gross calorific value of a coal sample is 9650 kcal/kg. Calculate the Net calorific value if it contains 6% hydrogen. (latent heat of steam = 587 kcal/kg). [2]
- Q.4. What is synthetic petrol? Name the two methods used to convert coal to gasoline. [2]
- Q.5. Under identical conditions why does impure metal corrode faster than pure metal? [2]
- Q.6. What is 'Flash set' of cement the name the compound responsible for it. [2]
- Q.7. What do you understand by annealing of glass and what is its significance? [2]
- Q.8. What is Steam Emulsion Number of a lubricant?
- Q.9. Why anodic coatings are better than cathodic coatings for corrosion control? [2]
- Q.10. What type of addition reactions occur in carbonyl compounds and why? [2]

**PART-B**

[5×4=20]

**(Analytical/Problem Solving Questions)**

**Attempt any five questions**

- Q.1. Calculate the amount of lime and soda required to soften 10,000L of a water sample containing the following impurities : [4]
- $\text{Ca}(\text{HCO}_3)_2 = 16.2 \text{ mg/L}$ ;  $\text{Mg}(\text{HCO}_3)_2 = 14.6 \text{ mg/L}$ ;  $\text{CaSO}_4 = 13.6 \text{ mg/L}$ ;  
 $\text{MgSO}_4 = 12.0 \text{ mg/L}$ ;  $\text{MgCl}_2 = 9.5 \text{ mg/L}$ .
- Q.2. Define knocking. Explain the phenomenon of knocking in a petrol engine. [1+3]
- Q.3. What is Pitting corrosion? Explain the mechanism. [1+3]

Q.4. Define cloud and pour point of a lubricating oil. How can you determine the cloud and pour point of a lubricating oil, explain with the help of a well labeled diagram. [1+3]

Q.5. Describe the synthesis, properties and uses of Paracetamol. [4]

Q.6. Explain the following : [2+2=4]

(a) Role of gypsum in cement

(b) Borosilicate glass

Q.7. What is Proximate analysis of fuel and what is its significance? [3+1]

**PART-C**

[3×10=30]

**(Descriptive/Analytical/Problem Solving/Design question)**

**Attempt any three questions**

Q.1. (a) What do you understand by Priming and Foaming? [5]

(b) 0.5g of  $\text{CaCO}_3$  was dissolved in HCl and the solution was made upto 500 mL with distilled water. 50 mL of this water sample required 48 mL of EDTA solution for titration. 50 mL of the sample water required 15 mL of EDTA and 50 mL of boiled water sample required 10 mL of EDTA solution for titration. Calculate the temporary, permanent and total hardness of the given water sample. [5]

Q.2. (a) Explain the determination of calorific value of a fuel using a Bomb Calorimeter. [5]

(b) A sample of coal contains the following constituents :

C = 88%; H = 4%; O = 4%; N = 2%; S = 2%

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Calculate the minimum weight of air required for the complete combustion of 1 kg of this coal sample. [5]

Q.3. (a) Explain the mechanism of chemical (dry) corrosion. [5]

(b) Explain the sacrificial anode cathodic protection method for corrosion control. [5]

Q.4. Write short notes on : [5+5]

(a) Manufacture of cement by Rotary kiln method

(b) Classification of Lubricants

Q.5. Explain the mechanism of : [5+5]

(a) Electrophilic aromatic substitution in benzene

(b) Nucleophilic substitution reaction in t-butylbromide. Also discuss the stereochemistry of the product.

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1E3104

Total No. of Questions : 22

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1E3104

B.Tech. I-Sem. ( Main/Back ) Exam. - 2024

1FY1-04 / 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)*

1. ....

2. ....

**PART-A**

(Answer should be given upto 25 words only)

All questions are compulsory

[10x2=20]

Q.1. Name the author of the short story "The Luncheon".

Q.2. Give the main similarities between Formal and Informal Communications.

Q.3. Mention two implications of Communication Gap.

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- Q.4. How do you categorize different types of Reported Speech? Give one example of each type.
- Q.5. Name the various types of Conjunctions, giving suitable example of each type.
- Q.6. What are the 4 types of Business Letters?
- Q.7. What is the meaning of resume?
- Q.8. What is the theme of the poem "No Men Are Foreign"?
- Q.9. What do you know about the vision, Rabindranath Tagore had for a free and sovereign country?
- Q.10. Mention the Divisions of Human Communication in short.

**PART-B**

(Analytical / Problem solving questions)

Attempt any five questions

[5x4=20]

- Q.1. Change the sentences into indirect speech :
- (i) "I worked as a waiter before becoming a chef," he said.
  - (ii) "I had a headache yesterday," she said.
  - (iii) "Don't play in the dark, boys," the teacher said.
  - (iv) "Where do you stay?" she asked him.
  - (v) "Have you got a mobile?" she says to her friend.
  - (vi) "Have you been to Jaipur before?" said the interviewer.
  - (vii) The beggar said, "Please help me".
  - (viii) The manager said to his secretary, "Would you mind coming early tomorrow?"

Q.2. Fill in the blanks :

- (i) If it had rained, you \_\_\_\_\_ (wet).
- (ii) I would have believed you, if \_\_\_\_\_ (lie, not) to me before.
- (iii) If I study hard, I \_\_\_\_\_ (ace) this test.
- (iv) If the weather \_\_\_\_\_ (be) good, our crops will flourish.
- (v) If it rains on Saturday, the picnic \_\_\_\_\_ (be) cancelled.
- (vi) If the weather is nice, the children usually \_\_\_\_\_ (walk) to school.
- (vii) If you get a final mark of less than 80%, you \_\_\_\_\_ (pass, not) the level.
- (viii) If I hadn't come to the USA to study, I \_\_\_\_\_ (make, not) so many friends from other countries.

Q.3. You are Vinod/Vinita of Rajasthan Technical University, Kota. Recently, your institute celebrated its Silver Jubilee. Write a report in 150-200 words for your magazine describing the various programmes arranged in your institute for the celebration.

Q.4. Write a Paragraph on any one of the following : A Visit to the Book Fair or Environmental Degradation. (120 - 150 words)

Q.5. You are Sumit Sharma, a Delhi University Science graduate. You're looking for suitable work. You saw an advertisement in the Hindustan Times looking for young and vibrant fresh graduates to work as sales assistants in a reputable firm. Prepare your resume.

Q.6. Describe in detail the main theme of the poem "If" by Rudyard Kipling mentioning the need for inculcating good qualities to become a 'man'.

Q.7. Give a detailed gist of the story "How Much Land Does a Man Need?" highlighting the impact of greed on human behaviour.

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**PART-C**

(Descriptive/Analytical/Problem solving/ Design questions)

Attempt **any three** questions

[3x10=30]

- Q.1. What do you mean by Communication? What is the importance of communication in a professional career? Explain the process of communication with a suitable example.
- Q.2. Explain the advantages and disadvantages of Verbal Communication in detail.
- Q.3. What are Modal Verbs? How many types of modal verbs are there? Describe giving examples.
- Q.4. How did the author react when he saw the girl for the first time? What do you think about the end of the story "The Night Train"?
- Q.5. As the Proprietor of Fancy Garment Showroom, Kota write a business letter to M/s Jenny and Jonny about their range of teenager's wear and variety they can provide you. Invent all necessary details.

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1E3106

Total No. of Questions : 22

Total No. of Pages : 03

Roll No. : .....

1E3106

B.Tech. I-Sem. ( Main/Back ) Exam. - 2024

IFY3-06 / 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)*

1. ....

2. ....

**PART-A**

**[10x2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1. With the help of diagram, explain how RAM, ROM and CPU interact with each other.

Q.2. Explain how read/write operation is carried out in an optical disk.

- 
- Q.3. What do you understand by software? Discuss its types.
- Q.4. Define Flowchart. List any important reason for using flowcharts.
- Q.5. What are the advantages and disadvantages of using a Pseudocode?
- Q.6. Show by an example that we can subtract both positive and negative number by 2's complement Arithmetic?
- Q.7. Why is C language called Middle Level Language?
- Q.8. What is dynamic initialization?
- Q.9. Differentiate Excess-3 BCD and Common BCD with suitable example.
- Q.10. Find out the 7's complement of this number :  $(157)_8$ .

**PART-B**

**[5x4=20]**

**(Analytical/Problem solving questions)**

**Attempt any five questions**

- Q.1. Discuss the various computer generation along with the key characteristics of the computers of each generation.
- Q.2. Explain stored program concepts. Discuss the architecture of stored program computers.
- Q.3. Explain program development lifecycle with the help of a block diagram.
- Q.4. Explain the features of Good Programming Language.
- Q.5. What is the difference between Interpreter and Compiler?
- Q.6. Find out the value of X in this conversion:  $(520)_8 = (150)_x$

Q.7 What is the difference between %f and %g format specifiers?

**PART-C**

**[3x10=30]**

**(Descriptive/Analytical/Problem Solving/Design question)**

**Attempt any three questions**

Q.1. What do you understand by Central Processing Unit (CPU)? Describe in detail the various units of computer system.

Q.2. Explain the procedure for executing a C program with flowchart.

Q.3. Solve the following:

(a)  $(253)_8 + (157)_8$

(b)  $(E010)_{16} - (DFFF)_{16}$

(c)  $(1010)_8 = (?)_2$

(d)  $(FEF)_{16} = (?)_8$

Q.4. Write a program to read a three digit positive integer number n, and generate possible permutation of numbers using the digits in a number.

For example: if n= 123, then the permutations are 123,132,213,231,312,321.

Q.5. Write a program to display number from 1 to 100. Redirect the output of the program to text file.

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1E3108

Total No. of Questions : 22

Total No. of Pages : 04

Roll No. : .....

1E3108

B.Tech. I-Sem. ( Main/Back ) Exam. - 2024

IFY3-08 / 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)*

1. ....

2. ....

**PART-A**

(Answer should be given upto 25 words only)

All questions are compulsory

[10x2=20]

Q.1. State the relationship between line voltage and phase voltage and line current and phase current of a 3-phase delta connected system.

- 
- Q.2. Define Apparent power and Power factor.
- Q.3. Why transformers are rated in kVA?
- Q.4. Give the emf equation of a transformer and define each term.
- Q.5. An 1100/400 V, 50 Hz single phase transformer has 100 turns on the secondary winding. Calculate the number of turns on its primary winding.
- Q.6. Write down the expression of equivalent resistance for 'n'-number of resistors in parallel connection.
- Q.7. Write the algorithm for Nodal Analysis.
- Q.8. Distinguish between induction motor and synchronous motor.
- Q.9. Draw the V-I characteristics of an ideal diode.
- Q.10. Give some method available for measuring 3-phase power.

### PART-B

(Analytical / Problem solving questions)

Attempt any five questions

[5x4=20]

- Q.1. An alternating voltage is given by  $V=230\sin 314t$ . Calculate :
- (i) Frequency
  - (ii) Maximum value
  - (iii) Average value
  - (iv) RMS value

- Q.2. State Thevenin's theorem and give a proof. Apply this theorem to calculate the current passing through the  $4\Omega$  resistor of the circuit of Fig.1

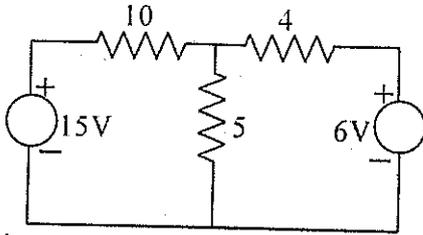


Fig. 1

- Q.3. Determine the power factor of a RLC series circuit with  $R = 5 \text{ ohm}$ ,  $X_L = 8 \text{ ohm}$  and  $X_C = 12 \text{ ohm}$ .
- Q.4. With a neat diagram explain the working of a PN junction diode in forward bias and reverse bias and show the effect of temperature on its V-I characteristics.
- Q.5. List out the characteristics of DC motor.
- Q.6. Derive an expression for conversion of a resistive network from star to delta.
- Q.7. What is working of BJT? Draw its equivalent circuit.

### PART-C

(Descriptive/Analytical/Problem solving/ Design questions)

Attempt any **three** questions

[3x10=30]

- Q.1. Explain with sketches the constructional features and working of a synchronous generator.
- Q.2. In a series circuit containing pure resistance and a pure inductance, the current and the voltage are expressed as :

$$i(t) = 5 \sin\left(314t + \frac{2\pi}{3}\right) \text{ and } v(t) = 15 \sin\left(314t + \frac{5\pi}{6}\right)$$

- (a) What is the impedance of the circuit?
- (b) What is the value of the resistance?
- (c) What is the inductance in henrys?
- (d) What is the average power drawn by the circuit?
- (e) What is the power factor?

Q.3. What is a SCR? Sketch V-I characteristics of Thyristor. Label the various voltages current and operating mode on this sketch.

Q.4. Explain Superposition theorem. Use the superposition theorem to find 'I' in the circuit shown in Fig. 2.

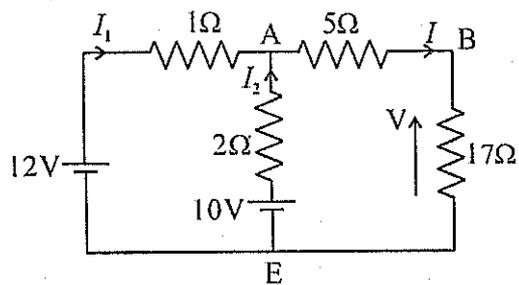


Fig. 2

Q.5. Write short notes on the following :

- (i) ELCB
- (ii) SFU

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