

2/EH-24 (ii) (Syllabus-2015)

2017

( April )

PHYSICS

( Elective / Honours )

( Electromagnetism, Electronics—I )

[ PHY 02 (T) ]

Marks : 56

Time : 3 hours

*The figures in the margin indicate full marks for the questions*

Answer Question No. 1 and any four from the rest

1. (a) Find the self-inductance of a air-type solenoid 40 cm long and radius 4 cm having 200 turns. 2
- (b) A 2 V battery of negligible internal resistance is applied to a coil of inductance 1 henry and of resistance 1 ohm. Calculate the time required by the current to attain a value half that in the steady state or maximum value. 3
- (c) Calculate the power factor of a 50 cycles/sec a.c. circuit in which an inductance of 0.1 H and 10  $\Omega$  resistance are connected in series. 3

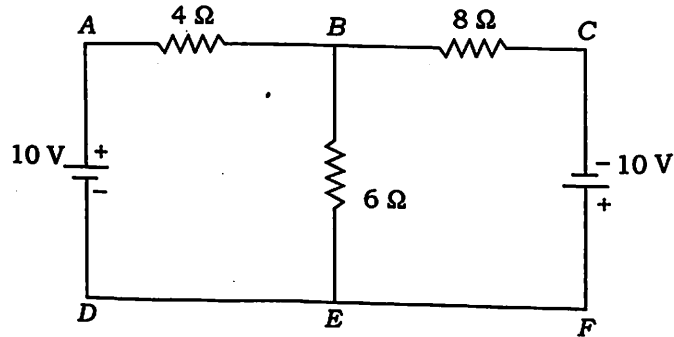
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( 2 )

- (d) Calculate the current through the  $6\ \Omega$  resistance using superposition theorem in the circuit given below :

4



2. (a) Obtain an expression for the potential and intensity of electric field due to a uniformly charged disc of radius ( $a$ ) at a finite distance ( $x$ ) from it. Show that the disc behaves as a point charge for  $x \gg a$ . 4+2=6
- (b) State Biot-Savart law and give its vector form. Using this law, obtain an expression for the intensity of magnetic field due to a straight current carrying conductor. 1+1+3=5
3. (a) Establish the relationship between the magnetic dipole moment and the angular momentum. Define gyromagnetic ratio. 4+1=5

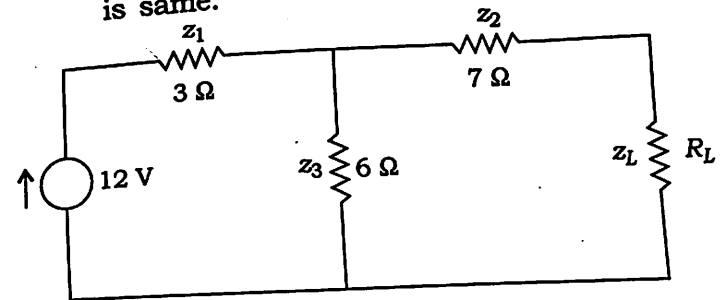
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- (b) Discuss the growth and decay of current in an  $L$ - $R$  circuit. What is the time constant of the circuit? 4+2=6

4. (a) Explain star and delta connections in three-phase power supply. 2+2=4
- (b) Express Faraday's law of electromagnetic induction in integral and differential form. 2+2=4
- (c) What is Maxwell's displacement current? Discuss its need in modifying Ampere's circuital law. 2+1=3
5. (a) State superposition theorem and prove it with the help of a simple two-mesh network. 1+3=4
- (b) Convert the linear network given below into Thevenin's equivalent network and then into Norton's equivalent network, and show that the power delivered to the load resistance in both the cases is same. 3½+3½=7



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6. (a) Explain the working of a half-wave rectifier with the help of a simple circuit. Define ripple factor and show that its value is 1.21 for a half-wave rectifier.  $3+1+2=6$
- (b) Explain current amplification factor in common base and common emitter configuration, and establish the relation between them ( $\alpha$ ,  $\beta$ ).  $2+2+1=5$
7. (a) Discuss the principle of feedback amplifiers. Give three important advantages of negative feedback amplifiers.  $3+(1\frac{1}{2}\times 3)=7\frac{1}{2}$
- (b) Draw a net circuit diagram of a two-stage R-C coupled CE amplifier and give a qualitative description.  $2+1\frac{1}{2}=3\frac{1}{2}$
8. Write short notes on any two of the following :  $5\frac{1}{2}\times 2=11$
- (a) Transformer—construction, theory and working
- (b) Logic gates—circuit diagram, truth table of OR, AND and NOT gates
- (c) Operational amplifiers—inverting and non-inverting amplifiers

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