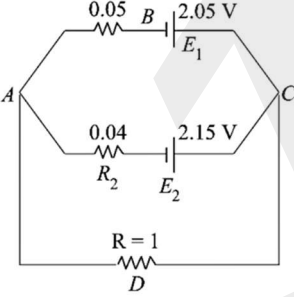
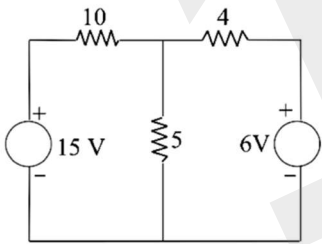


QP Code: D141430		Total Pages: 2	Name:
		Register No.	
SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2026			
APPLIED PHYSICS / PHYSICS			
APH2MN101 / PHY2MN101 Electromagnetism and Network Theorems			
2024 Admission onwards			
Maximum Time :2 Hours			Maximum Marks :70
Section A			
All Questions can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)			
1	State and explain superposition principle in electrostatics.		
2	What is an electric dipole, and how is electric dipole moment defined?		
3	State Gauss's law in electrostatics.		
4	Explain the terms 'magnetic flux' and 'magnetic flux density'.		
5	What is magnetic constant?		
6	Plot a graph showing the variation of the magnetic field with distance along the axis of a circular current-carrying loop.		
7	State and explain Kirchhoff's first law.		
8	How is Ampère's law used to determine the magnetic field around a long, straight current-carrying wire?		
9	State maximum power transfer theorem.		
10	What do you mean by power factor of an AC circuit?		
Section B			
All Questions can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)			
11	A disc of radius 0.1 m is oriented 30° to a uniform electric field of magnitude 2.0×10^3 N/C. What is the electric flux through a disc, and under what conditions will the flux magnitude be at its maximum and minimum?		
12	Derive the expression for the electric field in various regions of a system consisting of two infinitely large parallel sheets carrying equal and opposite charges.		
13	A straight horizontal copper rod carries a current of 50.0 A from west to east in a region between the poles of a large electromagnet. In this region there is a horizontal magnetic field toward the northeast (that is, 45° north of east) with magnitude 1.20 T. (a) Find the magnitude and direction of the force on a 1.00 m section of rod. (b) While keeping the rod horizontal, how should it be oriented to maximize the magnitude of the force? What is the force magnitude in this case?		
14	Apply Ampère's law to find the magnetic field due to a long cylindrical conductor.		

15	A circuit consists of a 9V battery and three resistors: $R_1 = 5\ \Omega$, $R_2 = 10\ \Omega$, and $R_3 = 15\ \Omega$. R_1 and R_2 are in series, while R_3 is in parallel with the combination.
16	By using Superposition Theorem, find the current in resistance R shown in Fig. 
17	Discuss about the variations in voltages and current when AC flows through a purely inductive circuit.
18	Explain the resonance in an RLC circuit.
Section C	
Answer any ONE. Each Question carries 10 marks (1x10=10 Marks)	
19	State Gauss's law and derive the expression for electric field at different regions due to a uniformly charged sphere of radius R and volume charge density ρ .
20	What are Thevenin's and Norton's theorems? Provide an explanation of each theorem along with a corresponding example.

QP Code:		Total Pages: 2		Name:	
				Register No.	
SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2025					
PHYSICS					
PHY2MN101 - Electromagnetism and Network Theorems					
2024 Admission onwards					
Maximum Time :2 Hours				Maximum Marks :70	
Section A					
All Questions can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)					
1	State and explain Coulomb's law in electrostatics.				
2	What is electric flux, and how can we determine the electric flux through a given area when the electric field is nonuniform?				
3	What is the expression for the force experiencing on a moving charge in a magnetic field and explain the right-hand rule to find the direction for force.				
4	What is cyclotron frequency and write down the expression for it.				
5	Define the magnetic dipole moment of a current-carrying loop and write its expression.				
6	State and explain Kirchhoff's second law.				
7	How do you determine the equivalent current source when converting a voltage source with a series resistance?				
8	Define ideal voltage source and ideal current source				
9	State Norton's theorem.				
10	What is Q factor in an AC circuit?				
Section B					
All Questions can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)					
11	A dipole consists of two charges, $+3.0 \mu\text{C}$ and $-3.0 \mu\text{C}$, separated by a distance of 6.0 cm. The dipole is placed in a uniform electric field of magnitude $2.0 \times 10^5 \text{ N/C}$. Initially, the dipole is oriented at an angle of 30° with respect to the electric field. (a) Calculate the magnitude of the torque acting on the dipole. (b) Determine the potential energy of the dipole in this orientation.				
12	Derive the expression for electric field due to an infinite plane sheet of charge in terms of its charge density.				
13	A magnetron in a microwave oven emits electromagnetic waves with frequency $f = 2450 \text{ MHz}$. What magnetic field strength is required for electrons to move in circular paths with this frequency?				
14	A long, straight conductor carries a 1.0-A current. At what distance from the axis of the conductor does the resulting magnetic field have magnitude $B = 0.5 \times 10^{-4} \text{ T}$?				

15	Two batteries A and B are connected in parallel and load of $10\ \Omega$ is connected across their terminals. A has an e.m.f. of 12 V and an internal resistance of $2\ \Omega$; B has an e.m.f. of 8 V and an internal resistance of $1\ \Omega$. Use Kirchhoff's laws to determine the values and directions of the currents flowing in each of the batteries and in the external resistance. Also determine the potential difference across the external resistance.
16	Apply Thevenin's theorem to calculate the current through the $4\ \Omega$ resistor in the given circuit. 
17	State and prove maximum power transfer theorem.
18	In a series circuit containing pure resistance and a pure inductance, the current and the voltage are expressed as: $i(t) = 5\sin(314t + 2\pi/3)$ and $v(t) = 15\sin(314t + 5\pi/6)$ (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?
Section C	
Answer any ONE. Each Question carries 10 marks (1x10=10 Marks)	
19	Discuss the characteristics of a series RLC circuit when an AC voltage is applied. How does resonance occur, and what are its effects?
20	State Ampere's law and derive the expression for the magnetic field produced by a solenoid and a toroid.