

QP CODE: D2BPH2503		(Pages: 2)		Reg. No :	
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SECOND SEMESTER FYUGP EXAMINATION, APRIL 2026 (Regular/Improvement/Supplementary) Discipline Specific Core (DSC) Courses - Minor PHY2MN101 : ELECTROMAGNETISM AND NETWORK THEOREMS (Credits: 4)					
Time: 2 Hours			Maximum Marks: 70		
Section A					
Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)					
1.	Study the electric flux when: a) Surface is face-on to electric field. b) Surface is tilted from a face-on orientation by an angle θ .	c) Surface is edge-on to electric field.	BL2	CO1	
2.	What is an electric dipole? Calculate the force and torque on an electric dipole.		BL2	CO1	
3.	Explain the principle of superposition of electric fields, taking in to account the variations according to charge distribution.		BL2	CO1	
4.	State Gauss's law for magnetism.		BL1	CO2	
5.	A solenoid is carrying a current. Using Ampere's law, show that the magnetic field inside the solenoid is uniform and proportional to the current.		BL2	CO4	
6.	Discuss the two general approaches to network analysis.		BL2	CO3	
7.	Derive an equation for Power transfer efficiency of a circuit.		BL2	CO3	
8.	What is an ideal current source ? Explain.		BL2	CO3	
9.	Discuss about dielectric loss and power factor of a capacitor.		BL2	CO5	
10.	What is the relationship between the applied voltage and the instantaneous current in an AC circuit with pure ohmic resistance?		BL2	CO4	
Section B					
Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)					
11.	When the terminals of a battery are connected to two parallel conducting plates with a small gap between them, the resulting charges on the plates produce a nearly uniform electric field between the plates. If the plates are 1.0 cm apart and are connected to a 100-volt battery the field is vertically upward and has magnitude $E = 1.00 \times 10^4$ N/C. (a) If an electron is released from rest at the upper plate, what is its acceleration? (PTO)		BL3	CO1	

	(b) What speed and kinetic energy does it acquire while traveling 1.0 cm to the lower plate? (c) How long does it take to travel this distance?		
12.	A charged paint is spread in a very thin uniform layer over the surface of a plastic sphere of diameter 12.0 cm, giving it a charge of $-35\text{ }\mu\text{C}$. Find the electric field (a) just inside the paint layer; (c) 5.00 cm outside the surface of the paint layer. (b) just outside the paint layer;	BL4	CO1
13.	A straight wire segment of length 0.5 m carries a current of 3 A and is placed in a magnetic field of 0.4 T. The angle between the wire and the magnetic field is 30° . Calculate the magnetic force on the wire.	BL3	CO2
14.	Derive the expression for the magnetic force between two long, straight parallel conductors carrying currents.	BL3	CO2
15.	Solve the following two simultaneous equations by the method of determinants : $4i_1 - 3i_2 = 1$ $3i_1 - 5i_2 = 2$	BL3	CO1
16.	The four arms of a Wheatstone bridge have the following resistances in ohms. $AB = 100, BC = 10, CD = 5, DA = 60$ A galvanometer of 15 ohm resistance is connected across BD. Calculate the current through the galvanometer when a potential difference of 10V is maintained across AC.	BL2	CO3
17.	Given a vector in the form of $3 + j4$, find its equivalent Exponential and Polar forms. Also, explain how you would represent this vector diagrammatically.	BL3	CO4
18.	A 60 Hz sinusoidal voltage $v = 141 \sin \omega t$ is applied to a series R-L circuit. The values of the resistance and the inductance are $3\text{ }\Omega$ and 0.0106 H respectively. (i) Compute the r.m.s. value of the current in the circuit and its phase angle with respect to the voltage. (ii) Write the expression for the instantaneous current in the circuit. (iii) Compute the r.m.s. value and the phase of the voltages appearing across the resistance and the inductance. (iv) Find the average power dissipated by the circuit. (v) Calculate the p.f. of the circuit. (power factor).	BL3	CO5

Section C

Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)

19.	A long straight wire carries a current I . Calculate the magnetic field at a distance r from the wire. Use the Biot-Savart Law to find the expression and discuss its physical meaning.	BL2	CO2
20.	Discuss different characteristics of an LCR series ac circuit including resonance frequency, resonance curve, half power bandwidth and Q factor	BL4	CO5