

GANPAT UNIVERSITY

B. TECH. SEMESTER: I & II (ALL BRANCHES)

CBCS (NEW) REGULAR & REMEDIAL EXAMINATION APRIL-JUNE 2017

2EE101: ELEMENTS OF ELECTRICAL ENGINEERING

Time: 3 Hours

Total Marks: 60

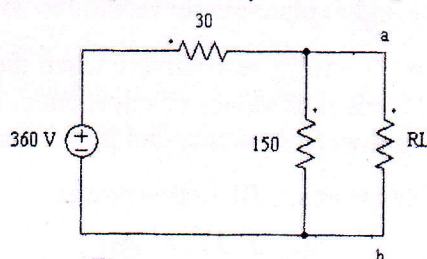
- Instruction:**
1. This question paper has two sections. Attempt each section in separate answer book.
 2. Figures to the right indicates full marks.
 3. Make suitable assumptions wherever necessary.

Section – I

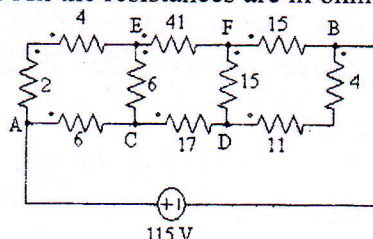
- Que. 1**
- (A) What is coefficient of coupling? Derive expression for the same between two magnetically coupled coils. [03]
 - (B) Give the comparison between electric and magnetic circuit. [03]
 - (C) Prove that the total inductance for two magnetically coupled coils connected in series is equal to $L_1 + L_2 \pm 2M$. [04]

OR

- Que. 1**
- (A) State and explain different types of lighting schemes. [04]
 - (B) The total inductance of two coils, A and B when connected in series is 0.5H or 0.2H, depending on the relative directions of the current in coils. Coil A, when isolated from coil B has a self-inductance 0.2 H. Calculate (a) the mutual inductance between two coils (ii) the self-inductance of coil B and (iii) coupling factor between two coils. [03]
 - (C) For circuit diagram shown below (a) Find the value of R_L so that it draws maximum power (b) When R_L is adjusted for maximum power transfer, what percentage of power delivered by the battery reaches R_L ? [03]



- Que. 2**
- (A) State and explain Thevenin's theorem. [04]
 - (B) Determine the current in the 17Ω resistor in the network shown in figure by using star-delta transformation. All the resistances are in ohms. [04]



- (C) Define following terms: (i) MMF (ii) Reluctance [02]

OR

- Que. 2**
- (A) What do you mean by capacitance? Derive the expressions for the parallel plate capacitor. [05]
 - (B) A parallel plate capacitor has plates of area 2 m^2 spaced by the three slabs of different dielectrics. The relative permittivities are 2, 3 and 6 and thicknesses are 0.4 mm, 0.6 mm and 1.2 mm respectively. Calculate the combined capacitance and dielectric stress in each material, when the applied voltage is 1000 V. [05]

- Que. 3 Attempt the following:
- (A) Derive the expression for the voltage across the capacitor at any instant after the application of dc voltage V to a circuit having a capacitance C in series with resistance R . [04]
- (B) A coil is wound uniformly with 300 turns over a steel ring of relative permeability 900 having a mean diameter of 20 cm. The steel ring is made of bar having a cross section of diameter 2 cm. If the coil has resistance of 50 ohm and is connected to 250 V d.c. supply, Calculate (i) m.m.f., (ii) field intensity in the ring (iii) reluctance of magnetic path (iv) permeance of magnetic path (v) flux. [03]
- (C) In a residential house, six lamps of 40W each and 4 fans 100 W each, switched on for 5 hours a day. Calculate energy consumed per day. If each unit of energy costs Rs. 1.90, what will be the total cost in January month? [03]

Section – II

- Que. 4 (A) Derive the relationship between the voltage and current for a purely inductive circuit connected to ac supply. Also show that the average power consumed by circuit is zero. [04]
- (B) Define the following terms: [03]
(i) Cycle (ii) Time period (iii) Frequency (iv) Instantaneous value
- (C) State and explain Faraday's laws of electromagnetic induction. [03]

OR

- Que. 4 (A) Obtain the r.m.s. value, average value, form factor and peak factor for half-wave rectified waveform. [04]
- (B) A 10mH coil is connected in series with a loss free capacitor to a variable frequency source of 20V. The current in the circuit has maximum value of 0.2A at a frequency of 100 kHz. Calculate (i) the value of capacitance and (ii) the Q-factor of the coil. [03]
- (C) Discuss self inductance and coefficient of self inductance. [03]
- Que. 5 (A) Define admittance and explain phasor method to solve the parallel circuit. [04]
- (B) Find the current in Z_1 and Z_2 respectively when they are connected in parallel and supplied by 230 V rms. The values of impedances are $Z_1 = 3+j4 \Omega$ & $Z_2 = 3-j4 \Omega$. Find total current drawn from supply and power factor at supply terminals. [04]
- (C) Define the following terms: (i) Active power (ii) Reactive power [02]

OR

- Que. 5 (A) Derive the relationship between (i) line voltage and phase voltage (ii) line current and phase current for delta connection. [05]
- (B) A balanced 3-phase star connected load of 18kw takes a leading current of 60A when connected across 3-phase, 440V, 50 Hz supply. Determine impedance, resistance, and capacitance and power factor of the load. [03]
- (C) Define the following terms: [02]
(i) Line voltage (ii) Phase voltage
- Que. 6 Attempt the following:
- (A) Explain Two wattmeter method for measurement of 3-phase power and prove that $W_1 + W_2 = \sqrt{3} V_L I_L \cos \phi$. [04]
- (B) What do you mean by tariff? Discuss important types of tariff. [03]
- (C) Three similar coils each of resistance 15 Ω and inductance of 0.25 H are connected (i) in star and (ii) in delta to a 3-phase, 400 V, 50 Hz supply. Calculate line and phase values of current and voltage in both the cases. Also calculate the power absorbed. [03]