



DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER I [ICT-EC/CE/IT]

SUBJECT: (ES104) BASIC ELECTRICAL ENGINEERING

Examination :
Date :
Time :

Regular
14/02/2023
2:30 to 5:30 pm

Seat No :
Day :
Max. Marks : 60

32

Tuesday

INSTRUCTIONS:

1. Answer each section in separate answer book.
2. Figures to the right indicate maximum marks for that question.
3. The symbols used carry their usual meanings.
4. Assume suitable data, if required & mention them clearly.
5. Draw neat sketches wherever necessary.

SECTION - I

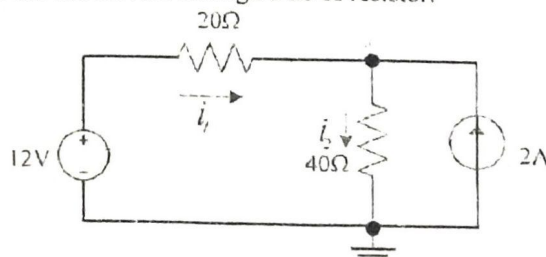
- Q.1 Do as directed.** [10]
- CO4 R (a) Write down the characteristics of magnetic flux lines. [2]
- CO4 A (b) A conductor of length 80 cm carries a current of 10 Amp. placed at right angles to a magnetic field of strength 5 Wb/m². Calculate the force in newtons exerted on it. [2]
- CO6 A (c) A 1-phase transformer is connected to 230 V, 50 Hz supply. Its turn ratio is 2. Find out secondary voltage on open circuit. [2]
- CO6 U (d) Define the term retentivity and coercivity in magnetic material. [2]
- CO9 A (e) A 3-phase, 4 Pole, 50 Hz induction motor rotates at 1380 rpm. Determine its slip. [2]
- Q.2 Attempt Any TWO from the following questions.** [10]
- CO5 A (a) Find the current required to produce a flux of 0.7 mwb in the air gap of a magnetic circuit which has an air gap of 0.5 mm. The iron ring has 6 cm² cross-section area. Magnetic Circuit has 60 cm mean length. Take relative permeability = 1300, N = 400 and leakage coefficient = 1.15. Neglect Fringing [5]
- CO5 A (b) Coils X and Y with 60 and 600 turns respectively, are wound side by side on a closed iron circuit of section 60 cm² and mean length 60 cm. Find out (1) mutual inductance between the coils (2) self inductance of each coil and (3) emf induced in X and Y, when current in coil X grows steadily from zero to 6 A in 0.015 second. Take relative permeability of iron as 570. [5]
- CO5 A (c) The combined inductance of two coils connected in series is 0.55H and 0.20H, depending on the relative direction of current in coils. If one of the coils, when isolated, has a self inductance of 0.11H, then calculate mutual inductance and coefficient of coupling. [5]
- Q.3** [10]
- CO7 A (a) A 6 KVA, 200/400 V, 50 Hz transformers have an iron loss of 80 W and full load copper loss 150 W. Find out full load efficiency at 0.8 power factor lagging. Also find out its regulation if full load output voltage is 385 V. [5]
- CO9 U (b) "A single phase induction motor has zero starting torque". Prove it using double field revolving theory with necessary diagram [5]

OR

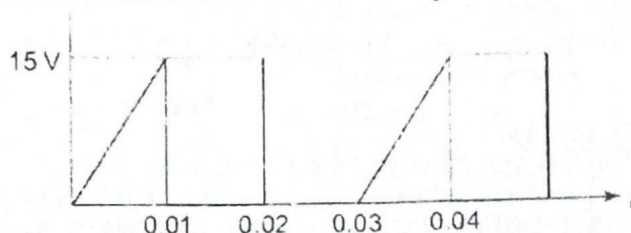
- CO7 A (a) The primary and the secondary windings of a 20 kVA transformer have resistance of 3.45 ohms and 0.009 ohms respectively. The primary and the secondary voltages are 4000V and 400V respectively. Calculate primary copper loss, secondary copper loss and total copper loss. [5]
- CO9 U (b) Discuss the construction and working operation of an alternator in detail. [5]

SECTION - II

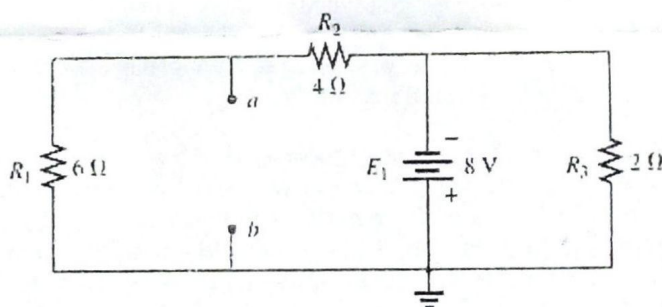
- Q.4 Do as directed.** [10]
- CO1 A (a) Find the current through a 20 Ω resistor. [2]



- CO1 U (b) Differentiate series and parallel RLC circuits. [2]
- CO1 A (c) In a series circuit containing pure resistance and a pure inductance, the current and the voltage is expressed as:
 $i(t) = 5 \sin(314t + 2\pi/3)$ and $v(t) = 15 \sin(314t + 5\pi/6)$
 Find out the resistance and impedance of the circuit. [2]
- CO1 A (d) A coil is connected in series with a pure capacitor. The combination is fed from a 10 V supply of 10.000 Hz. It was observed that the maximum current of 2 Amp flows in the circuit when the capacitor is of value 1 microfarad. Find the parameters (R and L) of the coil. [2]
- CO1 A (e) Find the Peak factor for the waveform given below. [2]



- Q.5 Attempt Any TWO from the following questions. [10]
- CO8 A (a) A short-shunt DC compound generator supplies 55 A at 220 V. If the shunt field resistance is 40Ω , the series field resistance is 0.02Ω and the armature resistance is 0.04Ω , determine the armature current and e.m.f. generated. Neglect brush drop. [5]
- CO8 A (b) A DC shunt motor takes an armature current of 100 A at 250 V. The armature circuit resistance is 0.5Ω . The machine has 4-poles and the armature is wave-connected with 615 conductors. The flux per pole is 0.05 Wb. Calculate the (i) back emf (ii) the speed of motor and (iii) the gross torque developed by motor. [5]
- CO8 A (c) A 6-pole DC shunt generator with 735 lap-connected armature conductors and running at 650 r.p.m. supplies a load of 15Ω resistance at terminal voltage of 200 V. The armature resistance is 0.25Ω and the field resistance is 220Ω . Find the armature current, the induced e.m.f. and the flux per pole. [5]
- Q.6 [10]
- CO2 A (a) Find the Thevenin equivalent circuit for the network given below across terminals a-b. [5]



- CO3 A (b) A resistance of 20Ω , an inductance of 0.2 H, and a capacitance of $100 \mu\text{F}$ are connected in series across 220-V, 50-Hz mains. Determine the following (a) Impedance (b) Current (c) Voltage across R, L, and C (d) Power in watts and VA (e) Power factor and Angle of lag. [5]
- OR
- CO2 A (a) A platinum coil has a resistance of 3.146Ω at 40°C and 3.767Ω at 100°C . Find (a) The resistance at 0°C (b) The temperature coefficient at 0°C and (c) The temperature coefficient at 40°C . [5]
- CO3 A (b) Two circuits with the impedances of $Z_1 = 10 + j15$ and $Z_2 = 6 - j8 \text{ ohm}$ are connected in parallel. If the total current supplied is 15 A, what is the power taken by each branch? Calculate also the Power factor of individual circuits and of combination. Draw a phasor diagram. [5]

Blooms Taxonomy levels : R-Remembering, U- Understanding, A-Applying, N-Analyzing, E- Evaluating, C-Creating