Ex/FTBE/EE/T/126/2018

Name of the Examination: FTBE 1st YR 2nd Sem. Exam.-2018

Subject: FUNDAMENTALS OF ELECTRICAL ENGINEERING

Time : Three hours Full Marks : 100

Group A (68 marks)

Attempt any four questions (Each carry 17 marks)

1a) Three impedances each of magnitude (15 - j20) ohms are connected in delta or mesh across a 3-phase, 400 volt A.C. supply. Determine the phase current, line current, active power and reactive power drawn from supply. (8)

1b) Explain Two-Wattmeter method of 3-phase power measurement with phasor diagram & connection diagram. (9)

2a) Mention with diagrams different the types of D.C. generators? (7)

2b) When driven at 1000 r.p.m. with a flux per pole of 0.02 Wb., a D.C. generator has an e.m.f. of 200 volts. If the speed is increased to 1100 r.p.m. and at the same time the flux per pole is reduced to 0.019 Wb., what is then the induced e.m.f.? (10)

3a) What is back-e.m.f in case of a D.C. motor? Why do we need a starter for it? (8)

3c) A 220V D.C. shunt motor with armature resistance of 0.5 ohm, has full-load armature current of 20 A and a speed of 1000 r.p.m. What resistance should be added in series with armature in order to reduce the speed by 25% for the same load torque. (9)

4a) What are the different losses in a transformer? Why transformer rating is in KVA? (6+2=8)

4b) Draw the equivalent circuit of a 200/400 V, 50 Hz. Single-phase transformer from the following test data: O.C. test: 200V, 0.7A, 70W (on l.v. side) & S.C. test: 15V, 10A, 85W (on h.v. side) (9)

5a) Define 'slip' in an Induction motor. What is the relation between the torque and rotor output of an Induction motor? (3+6=9)

5b) A 500 HP, 3-ph. 440V, 50 Hz. Induction motor with 6 poles has a speed of 950 r.p.m. on full-load, calculate 'slip'. How many completealterations will the rotor voltage make per minute? (8)

6a) Define 'Synchronous speed' in an Alternator. Give the vector representation of an Alternator on load with lagging power-factor. (8)

6b) A 3-phase star-connected alternator supplies a load of 8 MW at 0.8 p.f. lagging and at 10 KV terminal voltage. Its resistance is 0.1 ohm per phase and synchronous reactance is 0.66 ohm per phase. Calculate the line value of e.m.f. generated. (9)

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Group B (32 marks)

Answer any Two Questions

Each questions carry equal marks

1. a) Explain briefly the phenomena of electrical resonance in a RLC parallel circuit.

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b) Discuss the effect of varying frequency upon the current drawn and power factor in a RLC series circuit.

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c) Find the resistance between the junctions A and B of the given network.

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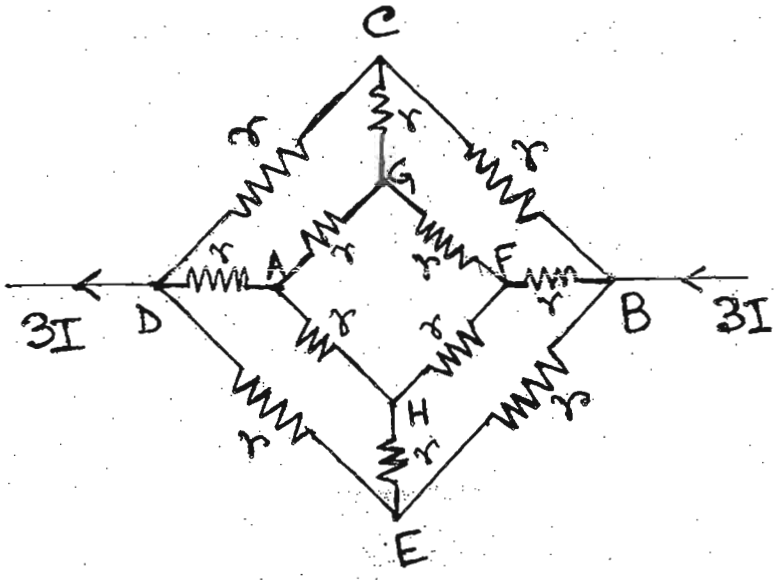

2. a) Derive the *r.m.s.* and *average* value of the Half Wave Rectified current.

8

b) A cast steel ring has circular cross sectional of $2cm$ in diameter and a mean circumference of $90cm$. The ring is uniformly wound with a coil of 800 turns. i) Calculate the current required to produce a flux of $2.6 \times 10^{-4}\ Wb$ in the ring. ii) If a saw cut of $2mm$ is made in the ring, then find the approximate flux produced the current calculated in i). The relative permeability of cast steel is 800.

8

3. a) Explain the magnetic hysteresis with suitable diagram. 4

b) Why are the r.m.s. values of alternating quantities more important than their average values?

4

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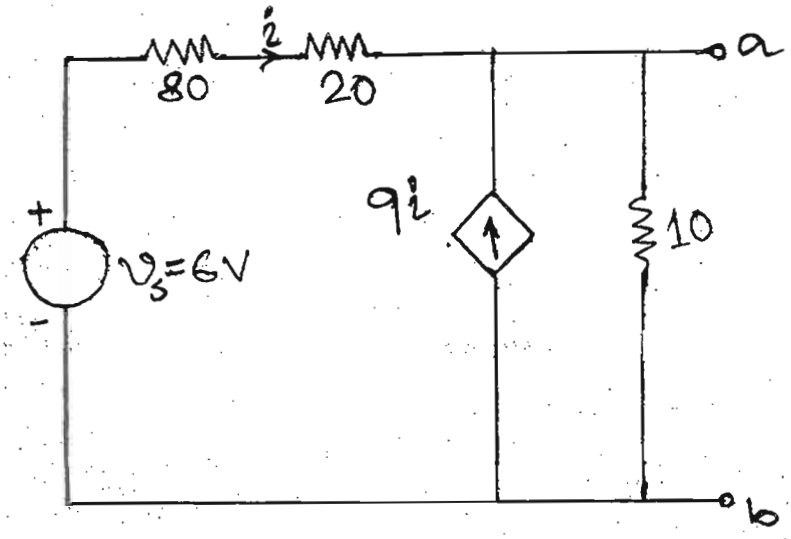
c) Determine the Thevenin's equivalent circuit as viewed from the open-circuit terminals a and b of the given network. 8



4. a) Show that an ideal current source and an ideal voltage source have infinite and zero internal resistance respectively. 4

b) State and explain the Superposition Theorem. 4

c) A coil of resistance 20Ω and inductance 0.07H is connected in parallel with a series combination of 50Ω resistance and 60μF capacitance. Calculate the i) total current and ii) power consumed by each branch, when the parallel combination is connected across 230V, 50Hz supply. Also draw the phasor diagram. 8

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