

FACULTY OF INFORMATICS
B.E. 2/4 (IT) I – Semester (Suppl.) Examination, July 2014

Subject: Electrical Circuits and Machines

Time: 3 Hours

Max.Marks: 75

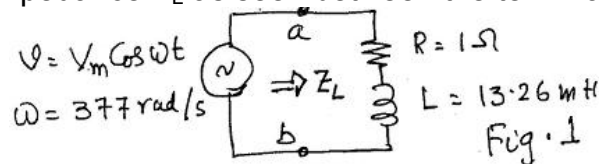
Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A (25 Marks)

- 1 Find the phasor form of the voltage
 $V(t) = 155 \cos(314t - 30^\circ) \text{ V}$ (2)
- 2 In a single-phase ac circuit, the voltage and current are given by
 $V = V \angle 10^\circ \text{ V}, I = I \angle -35^\circ \text{ A}$. Determine the power factor. (3)
- 3 What is the average real power in a three-phase circuit with the line voltage V_ℓ , line current I_ℓ and power factor angle, $-\theta$. (2)
- 4 Point out essential differences between a transformer and an autotransformer. (3)
- 5 Draw the speed versus torque characteristics of a dc series motor and mention its applications. (3)
- 6 Write the voltage equation of a shunt generator if V is the output voltage, I_ℓ is the load current and I_f if the field current. (3)
- 7 Explain why an induction motor cannot run at synchronous speed. (2)
- 8 Draw Torque-speed characteristics of a three-phase induction motor with rotor resistance control. (2)
- 9 Explain why a single-phase induction motor is not self starting. How do you produce a starting torque? (3)
- 10 What tests are conducted to determine the synchronous impedance of an alternator? (2)

PART – B (50 Marks)

- 11 a) Find the equivalent impedance Z_L between the terminals a and b if the frequency of the source is 377 rad/s (Fig. 1). (3)
- b) A capacitance of $509.8 \mu\text{F}$ is connected across the terminals a and b. Determine the equivalent impedance Z_L as seen between the terminals a and b. (7)



- 12 a) A three-phase circuit supplies a delta-connected (ABC) three-phase load, each of $40 \angle -30^\circ \Omega$. Draw the complete circuit if the three-phase voltages are $V_{an} = 240 \angle 0^\circ$, $V_{bn} = 240 \angle 120^\circ$, $V_{cn} = 240 \angle -120^\circ$. (5)

- b) Determine the line current I_{aA} in the circuit (a). (5)
- 13 a) Draw the equivalent circuit of a transformer and explain how the parameters are determined. (5)
b) Derive an expression for the regulation of a transformer and explain what you have understood about regulation. (5)
- 14 a) Why do you need a starter for starting a dc motor? (3)
b) Explain with necessary characteristics the speed control of a dc shunt motor with armature voltage control and field current control. (7)
- 15 a) Explain the principle of operation of a three-phase induction motor. (3)
b) Draw the per phase equivalent circuit of a three-phase induction motor and show that the air gap power (P_{ag}), rotor copper losses, gross mechanical power output are in the ratio 1 : S : (1-S) where S is the slip. Neglect stator copper losses and mechanical including iron losses. (7)
- 16 a) Draw the diagram of a stepper motor and explain its working. (5)
b) Draw the circuit diagram of a single-phase induction motor with capacitor start and capacitor run and explain its working. (5)
- 17 Write short notes on
a) EMF induced in an alternator (5)
b) Three-point starter. (5)
