B.E. (EE, CST, ETC, IT) Part-I, 1st Semester Final Examination, (Dec) 2012
Basic Electrical Engineering (EE-1201)

Time : 3 hours | Full Marks : 70

Use separate answer script for each half.
Answer ***SIX*** questions, taking ***THREE*** from each half.
Two marks are reserved for neatness in each half.

FIRST HALF

1(a) Explain the following terms with examples:
(i) Node, (ii) Branch, (iii) Active and passive elements, (iv) Linear and non-linear circuits and (v) Bilateral network.

(b) The four arms of a Wheatstone bridge have the following resistances:
AB = 100 Ω, BC = 10 Ω, CD = 4 Ω, DA = 50 Ω. A galvanometer of 20 Ω resistance is connected across BD. A cell of 10 V with negligible resistance is connected across AC. Calculate the current through the galvanometer by applying KCL and KVL.

[5+6]

2(a) State and explain Kirchhoff's laws for an electric circuit.

(b) Use Thevenin's theorem to determine the current through and voltage across the 2 Ω resistor given in Fig.-1.

[5+6]

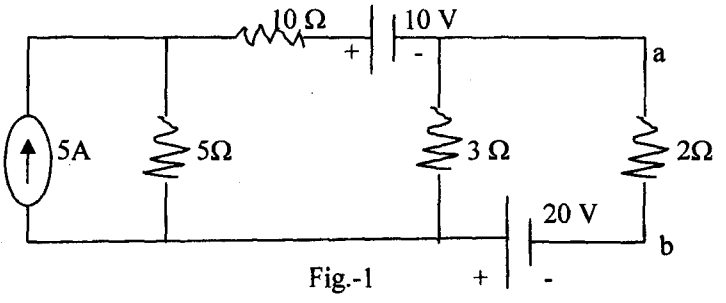

Fig.-1

3.(a) Define flux density and absolute permeability. What are their SI units?

(b) How is magnetic circuit analogous to electric circuit?

(c) A cast-steel electromagnet has an air-gap of length 2 mm and an iron path of length 30 cm. Find the mmf required to produce a flux density of 0.8 wb/m^2 in the air gap. Neglect leakage and fringing. Given H = 730 AT/m at B = 0.8 wb/m^2 for cast-steel.

[(2+2)+3+4]

4.(a) Derive emf equation of a d.c. generator.

(b) The armature of a 4-pole d.c. generator is wave connected with 778 conductors and is running at 1000 rpm. If the generated emf is 500 V, calculate the flux per pole of the machine.

(c) With a neat circuit diagram explain the operation of a 1-φ transformer at no-load and draw the phasor diagram.

[4+2+5]

5. Write short notes on any three of the following:
(a) Back emf of d.c. motor
(b) B-H curve
(c) Superposition theorem
(d) PMMC instrument

[$3^2/_3 \times 3$]

SECOND HALF

6.(a) Define alternating current and r.m.s value of alternating current

(b) Find the r.m.s value of the current represented by

$$i = 50\sin(\omega t + \frac{\pi}{3})A + 20\cos(\omega t + \frac{\pi}{3})A$$

(c) Find also the form factor of the above current

[(2+2)+3+4]

7. Draw the vector diagram for the circuit shown in Fig.2, indicating the terminal voltages

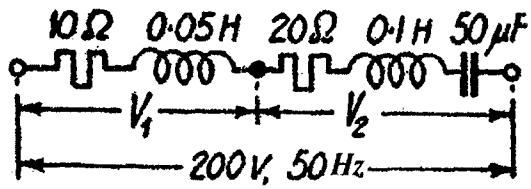

Fig.2

V_1 and V_2 and the line current. Find the value of (a) the current (b) V_1 and V_2 and (c) the power factor.

[3+2+4+2]

8. A star connected balanced load is excited by a balanced three phase three wire supply of 400V, 50Hz. Find (a) the current in each phase, (b) line current, (c) phase voltage, (d) active power drawn from the supply, (e) apparent power drawn from the supply and (f) reactive power consumed by the three phase load if per phase load consists of resistance 8 ohms and inductive reactance 6 ohms.

[2+2+1+2+2+2]

9. A resistor and a capacitor are in series with a variable inductor. When the circuit is connected to a 200V, 50 Hz AC supply, the maximum current obtainable by varying the inductance is 314A. The voltage across the capacitor is then 300V. Find the values of the resistor, the capacitor and the inductor in this condition.

[11]

10. Answer all parts:

(a) What is 'slip' with respect to a 3-phase induction motor?

(b) Define bandwidth and quality factor with reference to series resonance in an AC circuit.

(c) Deduce the relationship between line voltage (V_L) and phase voltage (V_P) in case of delta connection.

[3+4+4]