## Bachelor OF Electrical Engineering (Part Time) First Year Second Semester Examination, 2017

### Principles Of Electrical Engineering- II

Time: Three Hours                                     Full Marks: 100
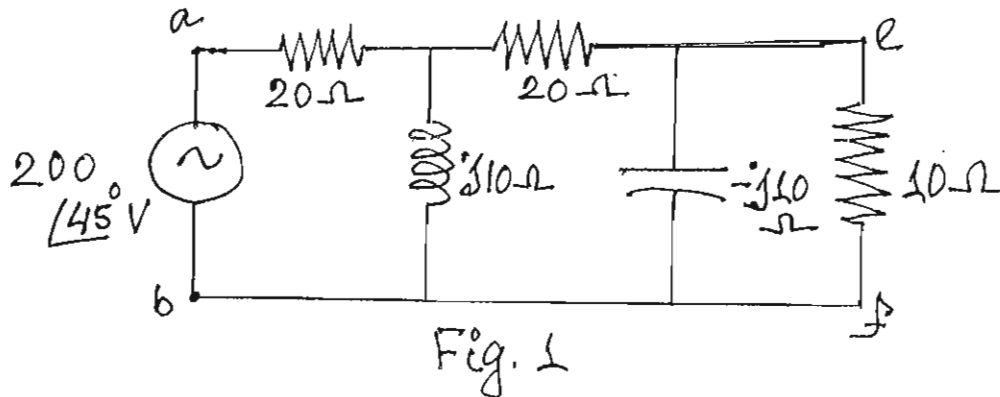
#### (50 Marks for each part)

#### Use a separate Answer Script for each Part

### PART-I

#### Answer *Any Three* Questions

#### *Two marks* for correct and well organized answers

Q.1a) State and explain Tellegence theorem.                                     8

Q.1b) Verify Reciprocity Theorem for the circuit shown in Fig. 1 when the voltage source is inserted

in the branch "e-f" instead of the branch "a-b".                                     8



Fig. 1

Q.2a) A ballast resistor with non-linear characteristic shown in the table below is connected

in series with a resistor of $6\Omega$ and 20V d.c. source having an internal resistance of $1.5\Omega$.

Determine graphically the circuit current and the voltage across the ballast and $6\Omega$

resistor.                                     12

| $V_{volt}$ | 0 | 0.5 | 1.5 | 2.0 | 4.0 | 8.0 | 12.0 | 15.0 | 16.0 | 18.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| $I_{amp}$ | 0 | 0.3 | 0.7 | 0.8 | 1.0 | 1.1 | 1.2 | 1.4 | 1.5 | 1.6 |

Q.2b) Define Q-point and state the significance of the same. 4

Q.3a) In R-L series circuit with variable L, prove that each point on z (impedance) locus above R-axis, corresponds to a point on the semi-circle below G-axis in Y-plane. Draw the necessary diagrams. 8

Q.3b) Draw the locus diagram of current and voltage of series R-L circuit with R varying from 0 to ∞. Prove that the current locus is semicircle. When the power of the circuit is maximum? Find out the expression for maximum power. 4+2+2

Q.4a) Find out the mutual inductance, equivalent series circuit impedance and the magnitude of current in the circuit arrangement shown in Fig.2. What do you mean by loosely coupled and tightly coupled circuits. 6+2
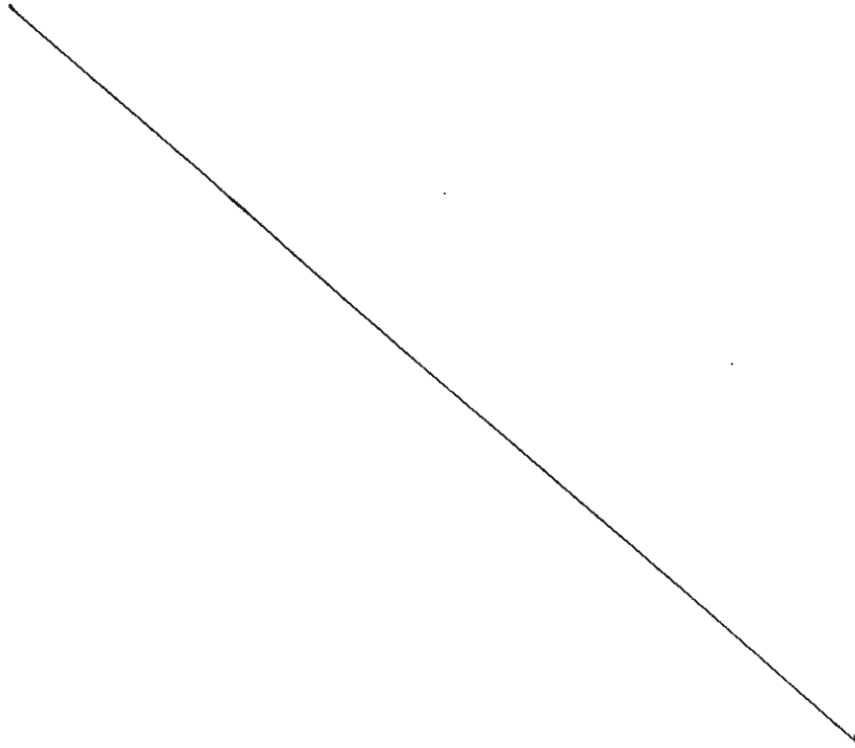


Fig. 2
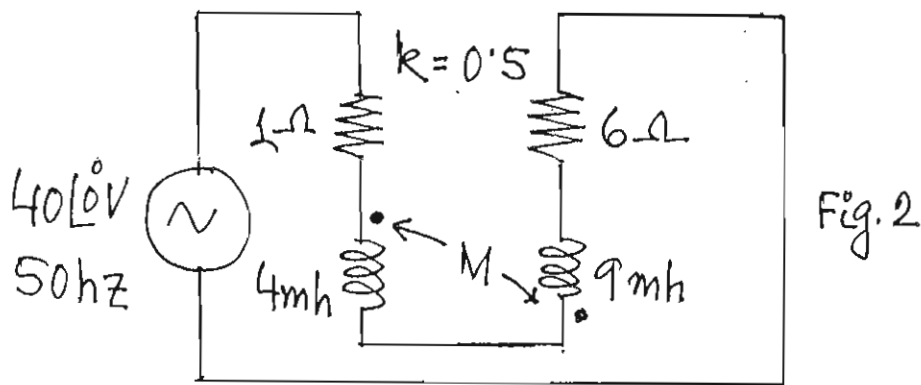
Q.4b) In the coupled network of Fig.3, find the current flowing through the resistances shown in Fig. 3.The co-efficient of coupling for the coils is 0.6. 8



Fig. 3
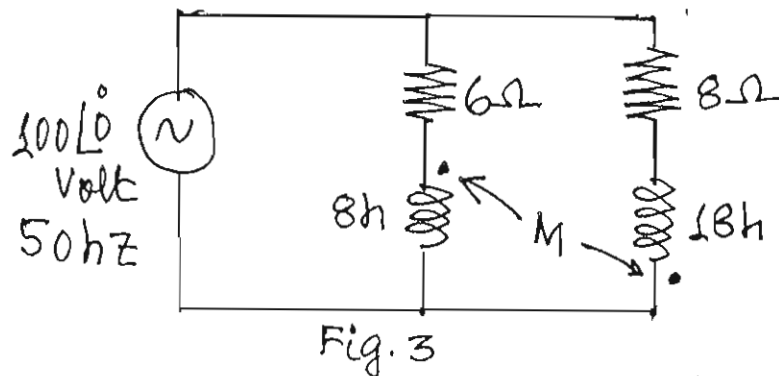
Q.5a). The number of turns on the primary and secondary windings of a transformer are 1000 and 200 respectively. When the load current on the secondary is 10A at 0.8 power factor lagging, the primary current is 30A at 0.707 power factor lagging. Determine the no load current of the transformer and its phase with respect to applied voltage.    8

Q.5b) Derive the expression for e.m.f. induced in a single phase transformer. Draw and explain the phasor diagram of the equivalent circuit of a transformer for inductive load.    4+4

B E. E.彡 (Part time)1$^{st}$ year, 2$^{nd}$ semester   EXAMINATION, 20  17

( 1$^{st}$/2$^{nd}$ Semester/~~Repeat/Supplementary/Spl. Supplementary/Old/Annual/Bi-Annual~~)

SUBJECT   Principles of Electrical Engineering-II

(Name in full)

PAPER

Full Marks ~~30~~/ 100

Time : ~~Two-hours~~/Three hours/~~Four-hours/Six-hours~~

(~~15~~/50 marks for each part)

Use a separate Answer-Script for each part
2 marks for neatness

| No. of questions | ~~Part-I~~ / Part II | Marks |
|---|---|---|
| | Answer any three questions    (3 × 16) | |
| 1.  a) | Derive the relation between the line voltage ($V_L$) and phase voltage ($V_{ph}$) for balanced three phase star connected system. Draw the phasor diagram for showing $V_L$ and $V_{ph}$. | 4+4 |
| b) | A balanced load of (8+j6) $\Omega$ per phase is connected to a three phase, 230 V supply. Find the line current, power- factor, power reactive VA and total VA for star connected load. | 8 |
| 2.  a) | Explain the meaning of phase sequence. Illustrate the notation $E_{ab}= E\angle 60^0$ | 4+4 |
| b) | Between any two terminals of a three- phase balanced load the voltage is 415 V and the resistance is 3 $\Omega$. The current in each of the three lines is 100A. Find the power factor of the load. Find also the resistance and reactance per phase of the load with star connection. | 8 |
| 3.  a) | What is the meaning of unbalanced load in three phase system? | 6 |
| b) | A three phase, 400V, 4 wire system has the following load impedances $Z_A=10\angle -60^0\,\Omega$, $Z_B=5\angle 0^0\,\Omega$ and $Z_C=10\angle 60^0\,\Omega$. Calculate the line currents and the neutral current and the power drawn by each load when phase sequence is i) ABC ii) ACB. | 5+5 |
| 4.  a) | Show that all third harmonics in the three phase star connected system are in same phase. | 8 |

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Full Marks 30/ 100
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Time : Two hours/Three hours/Four hours/Six hours

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2 marks for neatness

| No. of questions | Part-I / Part II | Marks |
|---|---|---|
| | Answer any three questions    (3 × 16) | |
| b) | A star-connected generator has a generated voltage per phase that contains only the fundamental, third, fifth and seventh harmonics. The line voltage as measured by a voltmeter is 230V and the voltage to neutral is 160 V. Calculate the magnitude of the 3rd harmonic in the generated voltage? | 8 |
| 5. a) | Define "Ferro-Resonance". With suitable circuit diagram, explain how to generate High Voltage in an inductive and capacitive mode. Draw V-I characteristic curve for Ferro-Resonance in the above mentioned two modes. | 12 |
| b) | Why harmonic analysis is necessary in three phase system? | 4 |