WRITE ALL YOUR WORK IN THE ANSWER BOOK PROVIDED.
EVERY ANSWER SHOULD INCLUDE ALL WORKINGS, NECESSARY DIAGRAMS AND FORMULAE.

START EACH ANSWER ON A FRESH PAGE.

Answer any **FIVE** Questions

1. Each Phase of a delta-connected load comprises of a resistance of 30 Ohms and an 80μF capacitor in series. The load is connected to a 400 volts, 50 Hz 3-phase supply.

   (a) Draw a diagram showing the delta-connected load. **(2 marks)**

   (b) Calculate:

   i. The phase current **(5 marks)**
   ii. The line current **(3 marks)**
   iii. The total power dissipated **(3 marks)**
   iv. The kVA rating of the load **(2 marks)**

   (c) Draw a phasor diagram for the load. **(5 marks)**

2. A six pole three-phase 440 volts, 50 Hz induction motor develops 8 hp at 955 rpm.

   If the pf is 0.85, the stator losses are 400 watts and the friction losses 0.5 hp.

   Calculate:

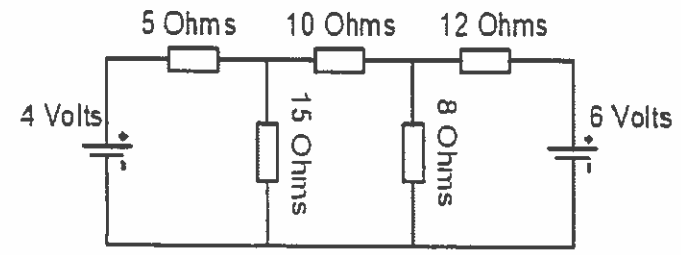
   (a) The slip **(4 marks)**
   (b) The rotor copper losses **(4 marks)**
   (c) The input to the motor **(4 marks)**
   (d) The efficiency **(4 marks)**
   (e) The line current **(4 marks)**

3 (a) A single-phase transformer is tested for open and short circuit tests. Explain each test, stating clearly any information sought from these tests regarding the transformer. **(8 marks)**

   (b) A single-phase transformer has twice as many turns on its primary winding as it has on the secondary winding. When connected with an open circuit secondary across a 200 volts, 50 Hz supply, the primary current was measured as 1 ampere, with a lagging power factor of 0.35. The transformer was then connected to the same supply to a load of 55 amperes at a power factor of 0.75 lagging.

   Neglecting the losses, determine the new primary current and the power factor, stating whether this is lagging or leading. Illustrate your solution with a labelled phasor diagram. **(12 marks)**

4. Using Kirchoff's laws calculate the current values in each resister of the network.



(20 marks)

5. Two similar capacitors connected in parallel take a total current of 5.04 amperes when connected across a 500 volts, 100 Hz supply.

   (a) Find the value of each capacitor. **(10 marks)**

   (b) Find the current taken from the supply if the capacitors are now connected in series across the same supply. **(10 marks)**

6. The input power to a three-phase 400 volts motor was measured by the two-wattmeter method. The readings were 5.2kW and -1.7kW.

   (a) Calculate:

   i. The total active power **(2 marks)**
   ii. The power factor **(2 marks)**
   iii. The line current **(2 marks)**

   (b) Draw the circuit diagrams for both star and delta configurations labelling all line and phase voltages and currents. **(6 marks)**

   (c) Draw the phasor diagrams for both star and delta configurations labelling all line and phase voltages and currents. **(8 marks)**

END OF PAPER

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EXAMINATION: AUTHORISATION B
February 2018

Paper I (Theory)

Time Allowed: 3 Hrs