

**Basic Electrical & Electronics Engineering  
(EE-101, Dec-2005)**

**Note:** Section A is compulsory. Attempt any five questions from section B & C taking at least two questions from each part.

**Section-A**

1. a) Write the mathematical expression for a 50 Hz sinusoidal voltage supplied for domestic purposes at 230 V.  
b) A wire carries both ac and dc current with max. value of ac 20A and 5A of dc. the frequency of resultant current is 25Hz. Write mathematical expression for the wire current as a function of time and draw the wave shape.  
c) Three 100Ω resistors are connected in star across a 440V, 50Hz, 3-phase supply. One of the phases is disconnected. What will be the line current and total absorbed power?  
d) Why is an iron-silicon alloy used in a transformer?  
e) Why cannot a 3-phase induction motor run at synchronous speed?  
f) Which losses occur in a dc machine?  
g) When a resistor is placed across 230V supply (dc) the current is 12A. What is the value of resistor that must be connected in parallel to increase the load current to 16A.  
h) What are uses of LVDT for measurements?  
i) Convert the fractional decimal number  $(0.625)_{10}$  into a binary number.  
j) What is field effect transistor? List its applications.

**Section-B**

2. (a) Give working principle of induction type energy meter.  
(b) Define mutual inductance (M) and show that  
$$K = \frac{M}{\sqrt{L_1 L_2}} \cdot K \leq 1$$
Where  $L_1$  and  $L_2$  are inductance of coil 1 and coil 2 respectively and K is coupling coefficient.
3. (a) Discuss principle of operation of a 3-phase induction motor. What is frequency of rotor current? Discuss.  
(b) A 3 phase induction motor is wound for 4 poles and is supplied from 3 phase, 50 Hz system. Calculate (i) the synchronous speed (ii) Speed of the motor when slip is 0.04 and (iii) the rotor when the motor runs at 60 rpm.
4. (a) Discuss how you analyze series R-C circuit. Draw its phasor diagram.  
(b) A series circuit consumes 7000 W when connected to 200V, 50Hz supply. the voltage across the resistor is 130V. Calculate (i) The resistance (R), Current (I), p.f (cosΦ), capacitance (c) and impedance (z) and (ii) also write equation for v (t) and i(t).
5. (a) Discuss the temperature dependence of resistance.  
(b) The filament of 60W, 230V lamp has a working temperature of 2000°C. Take the temperature coefficient of the material to be 0.005. Find the approximate current which flows at instant of switching on the supply to the cold lamp.

**Section-C**

6. (a) Define transducer. State its classifications with 4 examples of passive type transduction.  
(b) What is piezoelectric transducer? Give its advantages and disadvantages.
7. (a) Discuss working principle of a P-N junction diode. Also show its characteristics and mention some of its applications.  
(b) A germanium diode has a saturation current of  $10^{-8}$ A. Calculate for the junction current for a forward bias of 0.4. Volts and 300°K.
8. (a) What is an integrated circuit? Why it is so commonly used? Discuss.

- (b) Explain the terms: CMMR and output offset voltage.
9. (a) What is T-flip flop? Give its symbol and draw wave from the flip flop.  
(b) What is meant by IC-Timer? How is IC-555 used to generate square wave form? Explain.

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