Time: 3 Hours **Marks: 80**

Please check whether you have got the right question paper.

N.B. : 1. Q.No.1 is compulsory.
2. Answer any three out of remaining questions.

1. Attempt any four of the following: **20M**

a) What is an operational amplifier? Write the characteristics of an ideal Op-Amp.
b) Explain the working of dc motor and derive the condition for back emf.
c) Why single phase induction motor is not self-starting. How it is self-started?
d) Convert the following
   i) 1001.0010 binary number to decimal equivalent.
   ii) 7777 hexadecimal to its decimal equivalent.
e) Draw the v-i characteristics of SCR and TRIAC.

2. a) Explain the speed control of dc motor with necessary equation and diagram. **10M**
   b) Define starter. Explain 3 point starter with neat diagram. **10M**

3. a) Explain the working of 3phase induction motor with neat diagram. **10M**
   b) Explain the principle of operation as well as working of stepper motor with neat diagram **10M**

4. a) Define efficiency and voltage regulation of transformer. **10M**
   b) What is multiplexer and de multiplexer. Design 8:1 MUX and 1:4 D-MUX. **10M**

5. a) Explain the working of phase shift oscillator with neat diagram. **10M**
   b) Explain single phase half – wave circuit with R-L load and freewheeling diode with neat waveform. **10M**

6. **Write short notes on** **20M**
   a) Barkhausen criteria
   b) Circuit breaker and fuse
   c) Application of stepper motor
   d) Emf equation of transformer

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