B.E. CSE SECOND YEAR SECOND SEMESTER (Old) - 2018
ELECTRICAL TECHNOLOGY-B

Time : Three hours   **Full Marks: 100**

No. of questions		Answer any *five* (5×20) questions	Marks

1. (a) A 110V, 100W lamp is to be connected across a 220V, 50Hz AC supply. Find the value of the inductance, which should be connected in series, so that the bulb consumes its rated power at its rated voltage.   **7**

    (b) Explain the phenomena of electrical resonance in AC parallel R-L-C circuits. Evaluate the p.f. at resonant condition and show related phasor diagram. Why this is called a rejector circuit?   **7**

    (c) What is power factor? Relate power factor with the circuit parameters of a circuit supplied by purely sinusoidal single phase AC voltage source.   **6**

2. (a) Explain hysteresis loss in magnetic materials.   **6**

    (b) What is the effect of variation of the frequency of operation on core loss in an electrical machine?   **6**

    (c) An iron ring with mean circumferential length of 100cm, cross sectional area 3cm^2, has an air gap of 2mm. A winding of 1000 turns is put uniformly over it. Find the inductance value across the two terminals of the winding. Consider relative permeability of iron to be constant at 500. Also, find the flux density in the air gap if current passing through the winding is 5A.   **8**

3. (a) Show that power in balanced three phase circuit is constant at any instant of time.   **6**

    (b) How can you measure reactive power in balanced three phase circuit using two wattmeters? Explain with proper circuit and phasor diagrams.   **7**

    (c) Three identical coils, each having resistance of 3Ω and reactance of 20Ω are connected in delta across a three phase 400V supply. Find the line current. If two wattmeters are used to measure the power drawn by the load find readings of the two wattmeters. Show the circuit diagram.   **7**

4. (a) What are the conditions for proper voltage build up in self excited DC generators?   **6**

    (b) Derive and draw the external characteristics of a shunt generator.   **7**

    (c) Explain how the speed of a shunt motor can be controlled above and below the rated speed of the motor.   **7**

5. (a) Show that kVA rating of both primary and secondary of an ideal single phase two winding transformer are same.   **6**

    (b) Draw the primary referred exact equivalent circuit of a non-ideal single phase transformer. How is that circuit different from that of an ideal single phase transformer?   **6**

    (c) A 10kVA, 3.3kV/220V, 50Hz single phase transformer has following winding resistance and leakage reactances: HV side R1=3Ω, X1=15 Ω, on LV side R2=0.01 Ω, X2=0.15 Ω. The transformer is operated at 80% load with 0.9 lagging pf with HV side connected to rated voltage. Find (i) efficiency of the transformer (ii) input current (iii) output voltage. Neglect core loss and magnetizing component of current.   **8**

6. (a) What is synchronous speed of an induction machine? Why cannot an induction motor run at synchronous speed by itself?   **6**

    (b) Why does an induction motor require a starter? Describe the operation star-delta starter with suitable diagram.   **8**

    (c) Derive the condition for maximum torque in a three phase induction motor.   **6**

7. (a) What are the different types of synchronous machines based on rotor construction? Mention their areas of application.   **6**

    (b) Discuss the brushless excitation scheme for an alternator.   **7**

    (c)   Explain the process of synchronizing an alternator to the existing grid.   7

8. (a)   Discuss the working principle of moving iron type meters in brief. Can these measure AC quantities?   7

    (b)   What are the different damping mechanisms used in electrical measuring instruments? How is eddy current damping achieved?   7

    (c)   How can you make a multirange voltmeter by using a PMMC instrument? Explain with derivation the required component values.   6