(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 2301**  Roll No. ☐☐☐☐☐☐☐☐☐☐

# B.Tech.

## (SEM. I) ODD SEMESTER THEORY
## EXAMINATION 2012-13

### ELECTRICAL ENGINEERING

*Time : 3 Hours*                                    *Total Marks : 100*

**Note :–** Attempt **all** Sections. Assume missing data, if any.

### SECTION–A

1.  Answer *all* parts of this section :                (2×10=20)

    (i)     On what factors do the resistance of a conductor depends ?

    (ii)    Calculate the form factor of a square wave.

    (iii)   What is the use of condenser in single-phase AC motor ?

    (iv)    The dimension of L/CR is ............

    (v)     The maximum and minimum value of power factor can be

            .............

    (vi)    Write the name of different types of rotor of an alternator.

    (vii)   What is typical use of an autotransformer ?

    (viii)  What happens if DC supply is given to a transformer ?

    (ix)    Under no load running condition of synchronous machine, what will be the angle between the induced voltage and supply voltage ?

    (x)     Enlist the types of moving iron instrument.

# SECTION-B

2. Answer any **three** parts of this Section :                    (10×3=30)

(a) Using superposition theorem, calculate the current in the AB branch in the circuit shown in below figure :
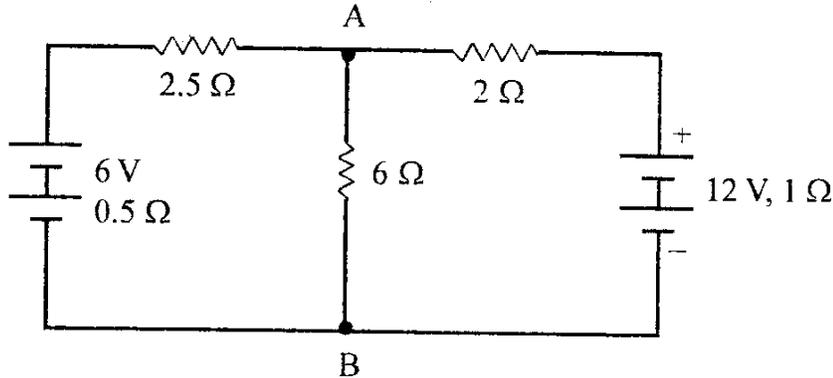


**Fig.**

(b) Obtain the power factor of a two branch parallel circuit where the first branch has $\overline{Z}_1 = (2 + j4)\,\Omega$ and second $\overline{Z}_2 = (6 + j0)\,\Omega$. To what value must the 6 $\Omega$ resistor be changed to result in the overall power factor 0.9 lagging ?

(c) A moving coil instrument having a resistance of 50 $\Omega$ has a full-scale deflection of 1 mA. Calculate :

   (i) Shunt resistance to convert the instrument into an ammeter of 2 A range.

   (ii) Net resistance of the meter.

(d) Prove that for a single-phase transformer :

$$(KVA)_{at\ max} = (KVA)_{rated}\sqrt{\frac{P_{core}}{P_{ohmic}\ (rated)}}$$

(e) A DC shunt motor runs at 600 rpm taking 60 A from a 230 V supply. Armature resistance is 0.2 ohm and field resistance is 115 ohms. Find the speed when the current through the armature is 30 A.

## SECTION–C

**Note :–** Answer any **five** questions of the following : **(10×5=50)**

3. Why power factor measurement is important ? What are causes and problems of low power factor ? How power factor can be improved ?

4. A series RLC circuit consisting of a resistance of 20Ω, inductance 0.2 H and capacitance of 150 μf is connected across a 230 V, 50 Hz source. Calculate :

   (i) the impedance

   (ii) the current

   (iii) Power factor

   (iv) the frequency of supply to be adjusted to make power factor unity.

5. Calculate current in a 1000 Ω resistor connected between terminals A and B, as shown in the below figure with the help of Thevenin's theorem.
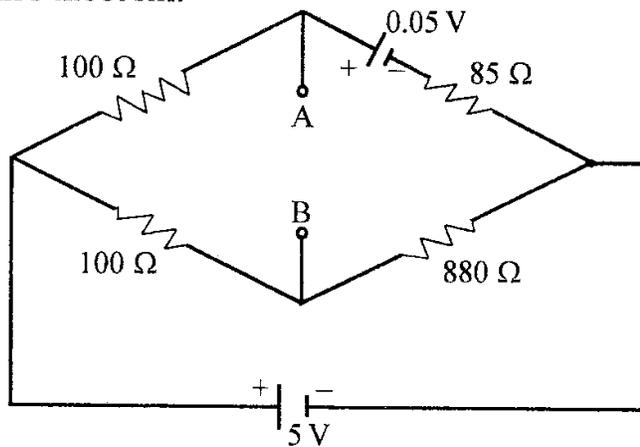


**Fig.**

6. Explain the speed-torque characteristics of a DC shunt and series motors.

7. What is the use of starter ? Explain various methods of starting of 3-phase induction motors.

8. Using double-revolving field theory, explain the principle of operation of a single-phase induction motor.

9. A balanced 3-phase star-connected load of 18 kW taking a leading current of 60 amperes when connected across a 3-phase 440 V, 50 Hz supply. Find the values and nature of load.