Code No: R05210302 **R05** **Set No. 2**

II B.Tech I Semester Examinations,May/June 2012
ELECTRICAL ENGINEERING
Common to Mechanical Engineering, Chemical Engineering, Mechatronics, Production Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive an expression for torque of a D.C.motor.
   (b) A D.C.motor takes an armature current of 110A at 480V. The armature resistance is 0.2Ω . The machine has 6-poles and the armature is lap connected with 864 conductors. The flux per pole is 0.05wb. Calculate the
      i. speed
      ii. torque. [6+10]

2. (a) Obtain the expression for star-delta equivalence of resistive networks.
   (b) Two identical 2000-turn coils X and Y are in parallel planes such that 75% of the magnetic flux produced by one coil links the other. A current of 10A in X produces a flux of 0.05mWb in it. If the current in X changes from +10A to -10A in 0.01sec, what will be the magnitude of the electromotive force induced in Y? Calculate the self inductance of each coil and mutual inductance. [8+8]

3. (a) Explain the constructional feature of transformers with neat diagram.
   (b) A 25 KVA, $1-\Phi$ transformer has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500V, 50 Hz mains. Calculate
      i. Primary and secondary currents on full-load
      ii. Secondary emf
      iii. Maximum flux in the core. [8+8]

4. (a) Define reactance, susceptance, impedance and admittance.
   (b) A constant voltage of frequency 1 MHz is applied to a lossy inductor (R in series with L), in series with a variable capacitor, C as shown in the figure 1. The current drawn is maximum, when C = 400 pF; while current is reduced to $\left(1/\sqrt{2}\right)$ of the above value, when C = 450 pF. Find the values of R and L. Calculate also the quality factor of the coil and the bandwidth. [4+12]

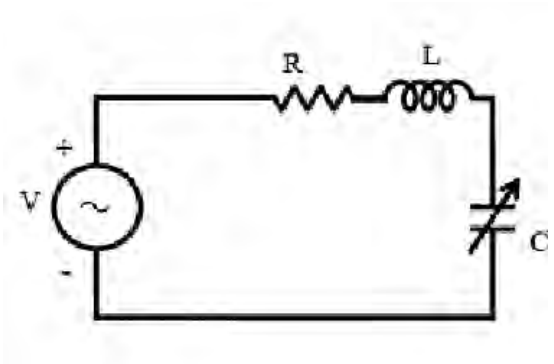

Figure 1

5. A compound generator is to supply a load of 250 lamps, each at 100W, 250V. The armature series and shunt windings have resistances of 0.06Ω & 0.04Ω and 50Ω respectively. Determine the generated e.m.f when the machine is connected in

   (a) long shunt

   (b) short shunt. Take drop per brush as 1V. [16]

6. A moving coil ammeter has a fixed shunt of 0.02Ω with a coil resistance of R =1000Ω and a potential difference of 500mV across it when full scale deflection is obtained.

   (a) To what shunted current does this correspond?

   (b) Calculate the value of R to give full scale deflection when shunted current I is

      i. 10 A

      ii. 75A

   (c) With what value of R is 40% deflection obtained with I = 100A? [16]

7. (a) Derive the starting torque equation of an induction motor.

   (b) In a 3-Φ induction motor, the stator reactance equals rotor reactance at stand-still ,while each resistance is one-fourth of its value. If motor develops a torque of 220N-m at 3% slip, determine starting torque. [8+8]

8. (a) Compare salient pole and non salient pole type synchronous machines.

   (b) The stator of a 3-phase, 16-pole alternator has 144 slots and there are 4 conductors per slot connected in two layers and the conductors of each phase are connected in series. If the speed of the alternator is 375 rpm, calculate the emf induced per phase. Resultant flux in the air-gap is 0.05 webers per pole, sinusoidally distributed. Assume the coil span as 150 degrees electrical. [6+10]

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Code No: R05210302 **R05** **Set No. 4**

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ELECTRICAL ENGINEERING
Common to Mechanical Engineering, Chemical Engineering, Mechatronics, Production Engineering

Time: 3 hours **Max Marks: 80**

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   (a) long shunt
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5. (a) Obtain the expression for star-delta equivalence of resistive networks.
   (b) Two identical 2000-turn coils X and Y are in parallel planes such that 75% of the magnetic flux produced by one coil links the other. A current of 10A in X produces a flux of 0.05mWb in it. If the current in X changes from +10A to -10A in 0.01sec, what will be the magnitude of the electromotive force induced in Y? Calculate the self inductance of each coil and mutual inductance. [8+8]

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(b) A 25 KVA, $1-\Phi$ transformer has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500V, 50 Hz mains. Calculate

i. Primary and secondary currents on full-load

ii. Secondary emf

iii. Maximum flux in the core. [8+8]

7. (a) Derive an expression for torque of a D.C.motor.

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8. (a) Define reactance, susceptance, impedance and admittance.

(b) A constant voltage of frequency 1 MHz is applied to a lossy inductor (R in series with L), in series with a variable capacitor, C as shown in the figure 1. The current drawn is maximum, when C = 400 pF; while current is reduced to $\left(1/\sqrt{2}\right)$ of the above value, when C = 450 pF. Find the values of R and L. Calculate also the quality factor of the coil and the bandwidth. [4+12]

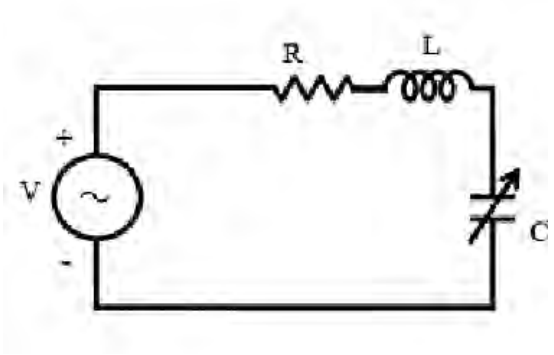

Figure 1

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Code No: R05210302 **R05** **Set No. 1**

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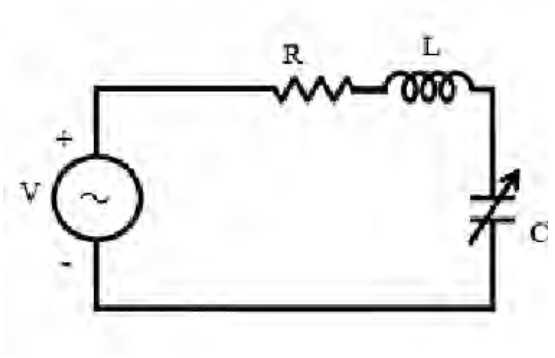

Figure 1

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Code No: R05210302 **R05** **Set No. 3**

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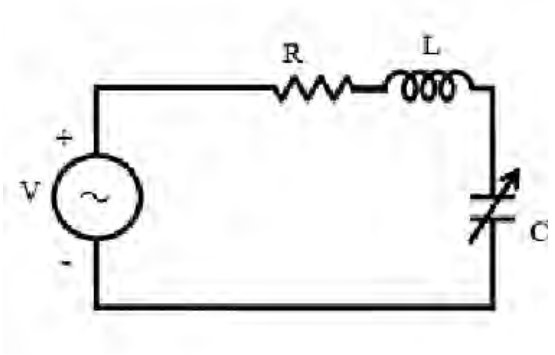

Figure 1

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