



Name : .....  
Roll No. : .....  
Invigilator's Signature : .....

**CS / B.TECH (OLD) / SEM-1 / EE-101 / 2010-11**

**2010-11**

**BASIC ELECTRICAL ENGINEERING**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) The capacitance of a capacitor is not influenced by
  - a) plate separator
  - b) plate thickness
  - c) plate area
  - d) nature of dielectric.
  
- ii) The efficiency of a circuit under maximum power transfer condition is
  - a) 50 %
  - b) 25 %
  - c) 75 %
  - d) 100 %.



- iii) Battery is an example of
- voltage dependent voltage source
  - current dependent voltage source
  - independent voltage source
  - independent current source.
- iv) The efficiency of a transformer is maximum when
- Cu losses are zero
  - Iron losses are zero
  - Cu losses are 50% of iron losses
  - Cu losses are equal to iron losses.
- v) For additive flux of two coils connected in series, the equivalent inductance can be expressed as
- $L_1 + L_2$
  - $L_1 + L_2 + 2M$
  - $L_1 + L_2 - 2M$
  - $L_1 + L_2 + M$ .
- vi) Resonant frequency  $f_r$  of a series RLC circuit is related to half-power frequencies  $f_1$  and  $f_2$  as
- $f_r = \frac{f_1 + f_2}{2}$
  - $f_r = \sqrt{f_1 f_2}$
  - $f_r = f_2 - f_1$
  - $f_r = \sqrt{f_1} + \sqrt{f_2}$ .
- vii) In the circuit shown in figure, if the power consumed by  $5\Omega$  resistor is 10 W, then power factor of the circuit is
- 0.8
  - 0.6
  - 0.5
  - zero.





**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

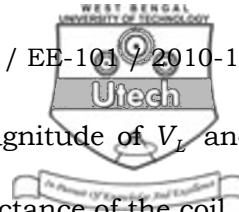
2. Derive the torque equation of a *dc* motor.
3. Explain the principle of working of a 3  $\phi$  induction motor.
4. A voltmeter is connected to a source having voltage waveform given by  $v = 20 \sin \omega t + 10 \sin 3\omega t + 5 \sin 5\omega t$ . If the voltmeter reads the *rms* value, find the reading of the voltmeter.
5. Explain the difference between statically & dynamically induced *emfs*. Give example.
6. Deduce an expression of electric field at a general point due to infinitely long charged conductor.

**GROUP – C**

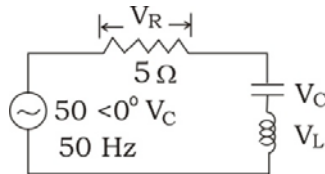
**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

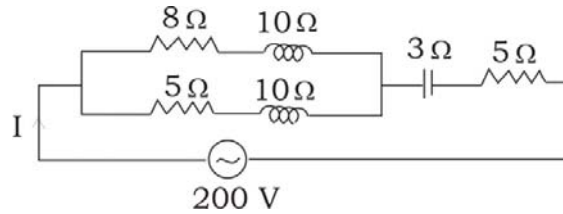
7. a) Why is a series resonant circuit called an acceptor circuit & parallel resonant circuit is called rejecter circuit ?



- b) In the circuit diagram shown, the magnitude of  $V_L$  and  $V_C$  are twice that of  $V_R$ . Find the inductance of the coil.



- c) For the circuit diagram shown below, find the current I.



3 + 5 + 7

8. a) Draw the phasor diagram of a single phase transformer for lagging power factor load.
- b) The open circuit & short circuit test data of a 5 kVA, 200 / 400 volt, 50 Hz single phase transformer are
- OC test : Primary voltage = 200 volts,  $I = 0.75$  A,  
 $W = 75$  W.
- SC test : Primary voltage = 18 volts, Current on  
 Secondary side = 12.5 A,  $W = 200$  W.
- Find the parameters of the equivalent circuit & draw the equivalent circuit w.r.t. primary side.

5 + 10



9. a) Deduce the *e.m.f.* equation of a *dc* generator.  
 b) A shunt generator delivers 50 kW at 250 V & 400 rpm.

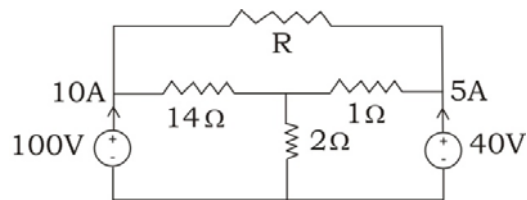
The armature resistance is  $0.02 \Omega$  and field resistance is  $50 \Omega$ . Calculate the speed of the machine when running on a shunt motor and taking 50 kW input at 250 V.

5 + 10

10. a) Define self & mutual inductance of coils.  
 b) Two coils *A* of 1000 turns and *B* of 500 turns are mutually coupled with 80% coupling. If a current of 3A in *A* produces a flux of 0.25 m wb, find the mutual inductance and coefficient of coupling between the coils.  
 c) A ring of mean diameter 30 cm is wound with 300 turns of copper wire carrying a current of 4A. The cross-section of the magnetic material of the ring is  $12 \text{ cm}^2$  and its relative permeability is 2000. Determine the flux through it.

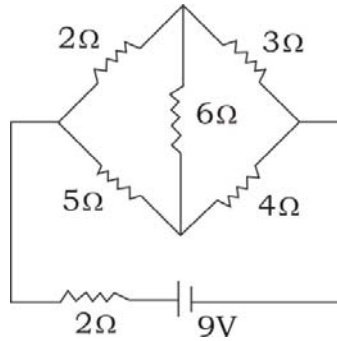
4 + 7 + 4

11. a) Find the value of R in the circuit shown below :





b) Calculate the current in the  $6\ \Omega$  resistor in the circuit below using Thevenin's theorem :



7 + 8

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