

**EE101/201**

USN	1	M	S						
-----	---	---	---	--	--	--	--	--	--

**M S RAMAIAH INSTITUTE OF TECHNOLOGY**

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE - 560 054

**SEMESTER END EXAMINATIONS - JANUARY 2015**

Course & Branch : **B.E : Common to all Branches**  
Subject : **Basic Electrical Engineering**  
Subject Code : **EE101/201**

Semester : **I/II**  
Max. Marks : **100**  
Duration : **3 Hrs**

**Instructions to the Candidates:**

- Answer one full question from each unit.

**UNIT - I**

1. a) Write the analogy between magnetic and electric circuits (04)  
b) A bridge network has arms:  $AB=4\Omega$ ,  $BC=6\Omega$ ,  $CD=8\Omega$ ,  $DA=3\Omega$ ,  $BD=2\Omega$ . (08)  
A current of 10 A enters node A and leaves node C. Find power dissipated by  $2\Omega$  resistor.  
c) Two coils having 1000turns and 1600turns respectively are placed close to each other, such that 60% of flux produced by one coil links the other. If a current of 10A flowing in the first coil produces a flux of 0.5milli-Wb, find the inductance of the second coil. (06)  
c) What are the limitations of Ohm's Law (02)
2. a) Obtain relation between self-inductances and mutual inductance for two mutually coupled coils. (06)  
b) Two coils A and B are wound on the same magnetic core. There are 300Turns on A and 2800Turns on B, a current of 4amps through coil A produces a flux of  $800\mu\text{Wb}$  in the core. If this current is reversed in 20m-sec, calculate the average emf induced in coils A and B. (08)  
c) A 20 V battery with an internal resistance of 5 ohm is connected to a resistor of X ohm. If an additional resistance of 6 ohm is connected across battery, find the value of X so that the external power supplied by the battery remains same. (06)

**UNIT - II**

3. a) Two impedances  $(4+j10)\Omega$  and  $(6+j4)\Omega$  are connected in parallel across ac supply and dissipates 600 watts. Find the power taken when the impedances are connected in series across the same supply. (08)



- b) Using the instantaneous values of voltage and current obtain an expression (05)  
for average power in a 1 phase ac circuit.
- c) In a series circuit containing two elements, an applied voltage of  $v=15 \sin(314t+5\pi/6)$  volts drives a current of  $i=5 \sin(314t+2\pi/3)$  amps. Find (i) circuit constants (ii) Power. (07)
4. a) An inductive coil is connected in series with a resistance of  $50\Omega$  across a 230 volts , 50 Hz ac supply. The voltage across the coil is 180volts and across the resistance is 130volts. Calculate (i) resistance and inductance of the coil (ii) Power factor of coil (iii) phase angle between supply voltage and current. (08)
- b) Two impedances  $(6-j8)\Omega$  and  $(16+j12)\Omega$  are connected in parallel if the total current of the combination is  $(20+j10)$ amps find the power dissipated by each branch. Now if a capacitor of 2 farads is connected across the parallel circuit what is power drawn from the supply. (08)
- c) A coil connected across an 100V DC supply takes 16.66amps and when connected across 100V, 50Hz, ac supply takes 10amps. Find the circuit constants of the coil. (04)

**UNIT – III**

5. a) With a neat diagram explain the construction and working of induction type energy meter. (08)
- b) The power consumed by a three phase balanced delta connected load connected across 400, 50Hz, balanced supply is measured by two wattmeters. The readings of the wattmeters were 3KW and 1KW. The latter reading was taken after reversing the current coil connection. Find the circuit constants. Assume the power factor of load to be lagging. (08)
- c) i) In a 3-phase power measurement of a balanced system by two wattmeter  $W_2 = 0$ . Then power factor of the circuit is \_\_\_\_\_ (04)
- (ii) In the expression  $\sqrt{3} V_L I_L \cos \Phi$  watts for power consumed by 3-phase circuit, the angle  $\Phi$  is the phase angle between \_\_\_\_\_ & \_\_\_\_\_
- iii) Dynamometer type wattmeter can be used for the DC or AC or both?  
Ans: \_\_\_\_\_
- iv) Three identical coils connected in star across a balance 3 phase supply consumes 300 watts. If these coils are delta connected across the same supply, then power consumed is \_\_\_\_\_ W.



**EE101/201**

6. a) With a neat sketch explain the construction and working of dynamometer type wattmeter. (08)
- b) Each of the two wattmeters connected to measure the input to a 3-phase circuit, reads 20KW. What does each instrument read, when the load power factor changes to 0.866 lagging with the total 3 phase power remaining unchanged in the altered condition. (06)
- c) Obtain the relation between phase and line quantities in a balance star connected load. (06)

**UNIT - IV**

7. a) Why a DC series motor should never be started without a load on it. (04)
- b) A 3 phase star connected alternator has the following data : (08)
- Voltage on open circuit: 4000V at 50Hz,  
Speed= 500RPM  
Stator slots/pole /phase= 3  
Approximate flux per pole = 0.05 Wb  
Find the number of conductors per slot.
- c) Draw and justify the speed-load characteristics of DC shunt and series motors and mention at least two of their applications, with reasons. (08)
8. a) Obtain an expression for EMF generated by a synchronous generator. (06)
- b) The armature resistance of a 25 HP, 250V series motor is  $0.2\Omega$  and series field resistance is  $0.05\Omega$ . When it takes 80Amps, the speed is 600RPM. Find the speed when the current is 50Amps. (06)
- c) Mention the relative merits and demerits of salient pole and non-salient pole alternator (04)
- d) An 8 pole lap connected armature, driven at 350RPM is required to generate 260V. The useful flux per pole is about 0.05Wb. If the armature has 120slots, calculate suitable number of conductors per slot. (04)

**UNIT - V**

9. a) With neat diagram explain the star-delta method of starting 3Phase induction motor of 97%. (06)
- b) The maximum efficiency of 97% of a 10KVA transformer is 97% and it occurs at 80% full load, UPF. Find efficiency at full load, UPF (06)



**EE101/201**

- c) An ideal 2300/230V, 50Hz, single phase transformer supplies a 1KW, 230V, 0.8 Power factor load. Find the primary and secondary currents of transformer. (04)
- d) A three phase 50Hz, induction motor runs at a speed of 1450RPM at full load. Find the synchronous speed. (04)
10. a) Obtain an expression for the load at which efficiency of transformer is maximum. (06)
- b) A 50Hz, 25KVA, 6000/250V, single phase core type transformer has a maximum core flux of 0.05Wb, determine the number of turns on each winding. Also calculate the full load primary and secondary currents. (06)
- c) Discuss the important features of squirrel cage and phase wound rotor constructions, in a three phase induction motor. Mention any two applications of phase wound type induction motor, with justification. (08)

\*\*\*\*\*