Code: DE05   **Subject: ELECTRICAL ENGINEERING**
Time: 3 Hours   **Max. Marks: 100**

JUNE 2011

NOTE: There are 9 Questions in all.

• **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
• **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
• **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
• **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1   **Choose the correct or the best alternative in the following:**   **(2×10)**

   a. The nodal analysis is primarily based on the approximation of

   (A) KVL   **(B)** KCL
   (C) ohm's law   **(D)** both **(B)** & **(C)**

   b. A good electronic conductor is one that

   (A) has low conductance   **(B)** is always made up of copper wire
   (C) produces a minimum voltage   **(D)** has few electrons

   c. The direction of rotation of synchronous motor can be reversed by

   (A) current to the field winding   **(B)** supply phase sequence
   (C) polarity of rotor poles   **(D)** none of the above

   d. A universal motor is one which

   (A) is available universally
   (B) can be marketed internationally
   (C) can be operated either in ac or dc supply
   (D) runs at dangerously high speed on no-load

   e. Which of the following connections is best suited for three phase supply 4-wire service

   (A) ▲-▲   **(B)** Y-Y
   (C) ▲-Y   **(D)** Y-▲

   f. In synchronous motor , damper winding is provided in order to

   (A) stabilize the rotor motion   **(B)** supports the rotor oscillations
   (C) develop necessary starting torque   **(D)** both **(B)** & **(C)**

g. A step up transformer increases

   (A) voltage   (B) current
   (C) power   (D) frequency

h. If the line voltage in a delta connected system is V_L, then the phase current will be equal to

   (A) V_L
   (B) ratio of V_L to square root of 3
   (C) ratio of to 3square root of V_L at all
   (D) product of V_L and square root of 3

i. A 12V battery source with an internal resistance of 1.2 ohms is connected across a resistor. Maximum power will be dissipated in the resistor when its resistance is equal to

   (A) zero   (B) 1.2 ohms
   (C) 12 ohms   (D) infinity

j. The voltages induced in the three windings of a three phase alternator are ____ degree apart in three phase

   (A) 120   (B) 60
   (C) 90   (D) 30

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Consider a 230V, 100W incandescent lamp. Determine   **(6)**
        (i)   The lamp resistance.
        (ii) The lamp current.
        (iii) The energy consumed by the lamp in 8 hours.

        b. State and prove the thevenin's theorem.   **(6)**

        c. Define the following terms:
           (i)   Linear circuit   (ii) Bilateral circuit
           (iii) unilateral circuit   (iv) Node   **(4)**

Q.3 a. Calculate the step current response of RC parallel circuit.   **(8)**

        b. A coil of resistance 2 Ω and inductance 0.02 H is connected in series with a condenser across 200V mains. What capacitance must the condenser have in order that maximum current may occur at (i) 25 Hz, (ii) 50 Hz, (iii)100 Hz? Find also the current and voltage across the condenser in each case.   **(8)**

Q.4 a. Derive the emf equation for the ideal single phase transformer.   **(8)**

b. Derive the condition for maximum efficiency for single phase transformers.**(8)**

Q.5 a. Derive the torque equation for dc machines. **(6)**

b. A 6-pole dc machine armature has 36 slots 2 coil-sides/slot, 8 turns/coil and is wave wound. The pole shoe is 18cm long and the mean airgap diameter is 25cm.The average flux density over one pole pitch is 0.8T. Find the gross torque and mechanical power output when the machine is operating as a motor at 1200rpm with an armature input current of 10A. **(6)**

c. What is the role of commutator in dc generator and dc motor? **(4)**

Q.6 a. Explain the working of single phase
    (i) Reluctance motor
    (ii) Hysteresis motor **(5+5)**

b. A 6 pole synchronous generator driven at 1000 rpm feeds a 4-pole induction motor which is loaded to run at a slip of 4%. What is the motor speed? **(6)**

Q.7 a. Name the motors used for following purposes
    (i) Drilling machine   (ii)   Domestic use
    (iii) Rolling mill drives   (iv) Paper industry
    (v) Textile industry   (vi) Blowers & fans
    (vii)Machine tools   (viii) Air compressors **(8)**

b. Discuss the advantages of high voltage dc transmission in electrical systems. **(8)**

Q.8 a. Write a short note on wind energy. **(8)**

b. Discuss the various methods used for energy storage. **(8)**

Q.9 Write short note on

    (i) open circuit test for transformer
    (ii) star delta transformation **(8+8)**