**Code: DE52/DC52    Sub: FUNDAMENTALS OF ELECTRICAL & ELECT. ENGG.**

## DiplETE – ET/CS

Time: 3 Hours      **DECEMBER 2014**      Max. Marks: 100

*PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.*

**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, selecting at least TWO questions from each part. 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:**     $(2 \times 10)$

a.  Barrier potential in a P-N junction is caused by

 **(A)** Thermally generated electrons and holes
 **(B)** Diffusion of majority carriers across the junction
 **(C)** Migration of minority carriers across the junction
 **(D)** Flow of drift current

b.  Whenever a conductor cuts magnetic flux, an emf is induced in that conductor; the above statement is based on

 **(A)** Faraday's law          **(B)** Joule's law
 **(C)** Weber and Ewing's theory     **(D)** Coulomb's law

c.  One of the common applications of Zener diode is a _____.

 **(A)** rectifier          **(B)** simple voltage reference source
 **(C)** clipper          **(D)** emitter follower

d.  Resistance of a wire is r ohms. The wire is stretched to double its length then its resistance in ohms is

 **(A)** r / 2          **(B)** 4r
 **(C)** 2r          **(D)** r / 4

e.  In case of DC series motor after saturation of magnetic core the relation between torque and armature current is

 **(A)** $T\alpha Ia$          **(B)** $T\alpha Ia^2$
 **(C)** $T\alpha\phi\, Ia$          **(D)** T is constant

f.  The CE amplifier circuits are preferred over CB amplifier circuits because they have

 **(A)** lower amplification factor
 **(B)** higher amplification factor
 **(C)** high input resistance and low output resistance
 **(D)** None of these

g. The potential divider biasing is used in amplifiers to

(A) limit the input ac signal going to the base
(B)  reduce dc base current
(C) reduce the cost of the circuit by limiting the number of resistors
(D) make the operating point almost independent of β

h. The difference between the synchronous speed & the actual speed of an induction motor is known as

(A) Regulation                          (B) Back lash
(C) Slip                                (D) Lag

i. For BJT to work as an amplifier, the Q-point should be in _____ region.

(A) saturation                          (B) cut-off
(C) active                              (D) none of these

j. A phase shift oscillator consists of three _____

(A) RC circuits                         (B) RL circuits
(C) LC circuits                         (D) RLC circuits

## PART A
### Answer at least TWO questions. Each question carries 16 marks.

**Q.2**  a. Derive an expression for the current flowing at any instant during the discharge of a capacitor C across a resistor R. **(8)**

b. The coil of a moving coil instrument is wound with 50 turns of wire. The flux density in the gap is 0.06 Wb/m$^2$ and the effective length of the coil side in the gap is 4cm. find the force acting on each side of the coil when the current is 40mA. **(8)**

**Q.3**  a. State and explain Thevenin's Theorem with suitable example. **(8)**

b. Three inductive coils each with a resistance of 15 ohms and an inductance of 0.03 H are connected (i) in star and (ii) in delta, to 3-phase, 400V, 50Hz supply.

Calculate for each of the above case (i) phase current and line current and (ii) total power absorbed. **(8)**

**Q.4**  a. Draw the connection diagram of shunt and series DC motors and explain. **(8)**

b. A 200 V dc shunt motor is taking a current of 70 A and runs at 500 rpm. The motor resistances are $Ra = 0.2\Omega$ and $Rsh = 100\Omega$. What resistance must be inserted in the armature circuit to reduce its speed to 350 RPM? Assume armature current is same. **(8)**

**Q.5** a. A single-phase transformer has 350 primary and 1050 secondary turns. The net cross-sectional area of the core is 55cm$^2$. If the primary winding be connected to a 400V, 50Hz single phase supply, calculate:
(i) maximum value of flux density in the core
(ii) voltage induced in the secondary winding **(8)**

b. A 3 phase, 4 pole, 50 Hz, 400V, 50hp star-connected induction motor is operating at a slip of 4 per cent, in order to deliver rated output power. Find out the following:
  (i)     synchronous speed
  (ii)    speed of rotating air gap field
  (iii)   speed of the induction motor
  (iv)   frequency of the rotor induced emf                                    **(8)**

## PART B
### Answer at least TWO questions. Each question carries 16 marks.

**Q.6** a. With the help of energy band diagram explain how conduction takes place in conductors, semiconductors and insulators.                         **(8)**

  b. What is P-N junction? Explain the formation of potential barrier and depletion layer without external voltage.                                        **(8)**

**Q.7** a. With the help of neat diagram, explain zener diode voltage regulator.   **(8)**

  b. Sketch circuit diagram and input-output waveforms of a negative series clipper circuit and positive shunt clipper circuits.                            **(8)**

**Q.8** a. Sketch and explain the shape of the common emitter input and output characteristics.  Explain how the characteristics are determined experimentally
                                                                              **(8)**

  b. Compare the performance and characteristics of CB, CC and CE amplifiers.**(8)**

**Q.9** a. Draw circuit diagram and frequency response curve of single stage CE amplifier.  Also discuss its working.                                      **(8)**

  b. Draw the circuit of Colpitt's oscillator and explain its operation.      **(8)**