

DiplETE – ET/CS**JUNE 2013**

Time: 3 Hours

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: (2×10)

- a. Which impurity atom will give P-type semiconductor when added to intrinsic semiconductor?
- (A) phosphorus (B) boron
(C) arsenic (D) antimony
- b. Kirchoff's laws are applicable to _____
- (A) dc circuits
(B) circuits with sinusoidal excitation only
(C) dc circuits and circuits with sinusoidal excitation
(D) circuits with any excitation
- c. The function of a starter in a dc motor is _____
- (A) to control its speed
(B) to avoid sparking
(C) to reduce the starting current to safe values
(D) to minimize the armature reaction effect
- d. The working efficiency of a 3-phase induction motor as compared to transformer is _____
- (A) lesser (B) higher
(C) much-much less (D) much higher
- e. While comparing magnetic and electric circuits, the reluctance of magnetic circuit is compared with which parameter of electric circuit?
- (A) current (B) resistance
(C) E.M.F (D) current density

- f. The breakdown voltage in a zener diode _____
- (A) is almost constant
 - (B) is very small
 - (C) may destroy the diode
 - (D) decreases with increase in current
- g. In an R-L circuit, the impedance is $30\ \Omega$ at a frequency of 100 Hz. At 200 Hz the impedance should be _____
- (A) $30\ \Omega$ or more
 - (B) $60\ \Omega$ or more
 - (C) $15\ \Omega$ or less
 - (D) more than $30\ \Omega$ but less than $60\ \Omega$
- h. If one of the diodes in a full wave bridge rectifier opens, the output is _____
- (A) 0V
 - (B) one-fourth the amplitude of the input voltage
 - (C) a half wave rectified voltage
 - (D) a 120 Hz voltage
- i. In a BJT RC Phase Shift Oscillator, the minimum number of RC networks to be connected in cascade will be _____
- (A) one
 - (B) two
 - (C) three
 - (D) four
- j. The voltage divider bias circuit is used in amplifiers quite often because it _____
- (A) limits the ac signal going to the base.
 - (B) makes the operating point almost independent of β .
 - (C) reduces the dc base current
 - (D) reduces the cost of the circuit

PART A

Answer at least TWO questions. Each question carries 16 marks.

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- Q.2** a. Derive the expression for Coulomb's Law of Electrostatics. (8)
- b. What is meant by Self Induced EMF and derive an expression for the coefficient of self induction (8)
- Q.3** a. State and explain Superposition Theorem. (8)
- b. Explain the relationship between Line and Phase quantities in Delta connected circuit with the help of a phasor diagram. (8)
- Q.4** a. Explain the principle of operation of DC motor with neat sketches. (8)

- b. A 230 volts dc shunt motor runs at 1000 rpm when the armature current is 25 A. The resistance of the armature circuit is $0.3\ \Omega$. Calculate the additional resistance required in the armature circuit to reduce the speed of the motor to 750 rpm, assuming that the armature current is 25 A. (8)

Q.5 a. What is Step-Up transformer? Derive an expression for the EMF equation of a Transformer. (8)

- b. An 8-pole alternator runs at 750 rpm. It supplies power to a 6—pole, 3-phase the induction motor, which has a full load slip of 3 %. Find
(i) the speed of the induction motor and
(ii) the frequency of its rotor EMF. (8)

PART B

Answer at least TWO questions. Each question carries 16 marks.

Q.6 a. What is meant by doping? Explain donor doping with neat diagram. (8)

- b. Discuss the typical forward and reverse characteristics of a germanium diode and compare it with silicon diode characteristics. (8)

Q.7 a. Draw the circuit of Full Wave Bridge Rectifier and explain its operation with input and output waveforms. (8)

- b. What is a Clamper? Explain the operation of negative voltage clamper circuit with the help of input and output waveforms. (8)

Q.8 a. Draw and explain the Common-Base output characteristics. Label different regions on the characteristics. (8)

- b. Design a collector-to-base bias circuit to have $V_{CE} = 5\ \text{V}$ and $I_C = 5\ \text{mA}$, when the supply voltage is 15 V and the transistor h_{FE} is 100. (8)

Q.9 a. Draw the circuit of series voltage negative feedback and derive an expression for its voltage gain. (8)

- b. What is an Oscillator? Explain the operation of BJT Hartley oscillator. (8)