

DiplETE – ET/CS (NEW SCHEME) - Code: DE52/DC52

Subject: **FUNDAMENTALS OF ELECTRICAL & ELECTRONICS
ENGINEERING**

Time: 3 Hours

DECEMBER 2011

Max. Marks: 100

NOTE: There are 9 Questions in all.

- Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.
- 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. The magnitude of reluctance for magnetic circuit of magnetic flux path length 'l' and cross-sectional area of the circuit through which flux is passing is 'a', given by the equation.

(A) $\frac{l}{\mu_o a}$

(B) $\frac{a}{\mu_o \mu_r l}$

(C) $\frac{l}{\mu_o \mu_r a}$

(D) $\frac{la}{\mu_o \mu_r}$

- b. In a star connected balanced circuit, the phase difference between the line voltage and the phase voltage is equal to

(A) 60°

(B) 30°

(C) 120°

(D) $30^\circ - \phi$

- 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. A 3-phase induction motor is operating at a light load, its slip is approximately.

(A) 1.5%

(B) 3%

(C) 4%

(D) 5%

- e. When a p-n junction is forward biased.
- (A) it offers a low resistance and a large current flows through it.
 - (B) it offers a high resistance and a small current flows through it.
 - (C) it acts as an insulator and no current flows through it.
 - (D) The width of depletion layer increases.
- f. In full-wave rectification, if the input frequency is 50 Hz, then the output frequency will be
- (A) 50 Hz
 - (B) 75 Hz
 - (C) 100 Hz
 - (D) 200 Hz
- g. The CE amplifier circuits are preferred over CB amplifier circuits because they have
- (A) lower amplification factor
 - (B) larger amplification factor
 - (C) high input resistance and low output resistance
 - (D) None of the above
- h. 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 .
- i. One of the effects of negative feedback in amplifiers is to
- (A) increase the noise
 - (B) decrease the harmonic distortion
 - (C) increase the voltage gain.
 - (D) decrease the bandwidth
- j. An oscillator is an electronic device which converts
- (A) mechanical energy into electrical energy
 - (B) electrical power into mechanical power.
 - (C) dc power into ac power
 - (D) ac power into dc power and *vice-versa*

PART A

Answer atleast TWO questions. Each question carries 16 marks.

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- Q.2** a. State Faraday's law and derive an expression for Faraday's law of electromagnetic induction (e). (8)
- b. A coil consisting of 120 turns is placed in the magnetic field of 0.8 mWb. Calculate (i) the average emf induced in the coil when it is moved in 0.08 sec from the given field to the field of 0.3 mWb. If the resistance of the coil is 200 Ω , find (ii) the induced current in the coil. (8)

- Q.3** a. What is Kirchhoff's voltage law and determine the current in the $8\ \Omega$ resistor for the circuit as shown in Fig.1, by using K.V.L. (7)

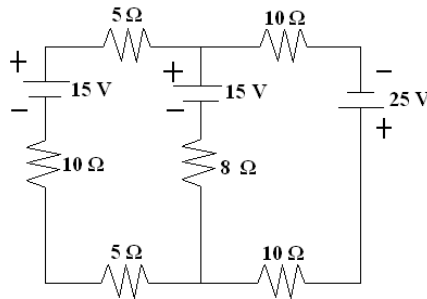


Fig. 1

- b. What are the advantages of three phase circuits over single phase circuits and explain how three-phase emf is being generated with the help of suitable diagrams and waveforms. (9)
- Q.4** a. What is the basic difference between dc motor and dc generator and explain the principle of operation of dc motor with neat sketch. (8)
- b. A 120 V dc shunt motor draws a current of 200 A. The armature resistance is $0.02\ \Omega$ and shunt field resistance is $30\ \Omega$. Find
 (i) back emf. If the lap wound armature has 90 slots with 4 conductors per slot at
 (ii) what speed will the motor run when the flux per pole is 0.04 Wb. (8)
- Q.5** a. What are the differences between three phase induction motor and transformer? Explain briefly the principle of operation of 3-phase induction motor. (10)
- b. An 8-pole alternator at 750 rpm and it supplies power to a 6-pole, 3-phase induction motor, which has a full load slip of 3 percent. Determine
 (i) Full load speed of the induction motor and
 (ii) Frequency of its rotor emf. (6)

PART B

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

- Q.6** a. What is intrinsic semiconductor? Explain with neat diagram how do we make it n-type extrinsic semiconductor. (8)
- b. Draw the V-I Characteristics of a p-n junction silicon diode and explain
 (i) Forward voltage drop (V_F)
 (ii) Reverse saturation current (I_R)
 (iii) Reverse breakdown voltage (V_{BR}) from the characteristics and give their typical values. (8)

- Q.7** a. What is a rectifier? Draw the circuit diagram of full-wave rectifier using two diodes and explain its operation with the help of input and output waveforms. (9)
- b. Define positive and negative shunt clipping circuits and determine the output waveform for the circuit shown in Fig.2, when the input is a 20 V (P-P) sinusoidal signal. Assume ideal diodes. (7)

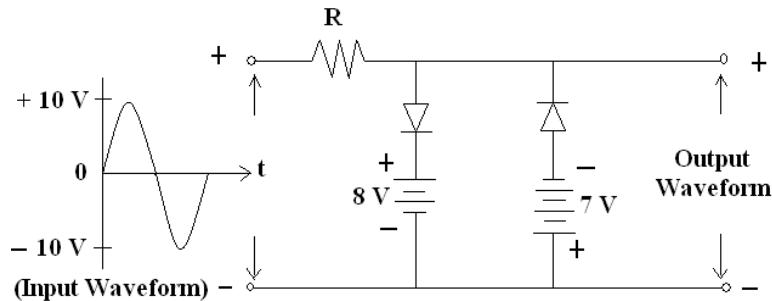


Fig. 2

- Q.8** a. Draw the output characteristics of BJT Common Base Configuration and explain cut-off, active and saturation regions from the curves. (8)
- b. For the voltage divider bias circuit as shown in Fig.3, draw the dc load line and determine the operating point (V_{CE} , I_C). Assume $V_{BE}=0.3$ V and $\beta=60$ for the transistor used. (8)

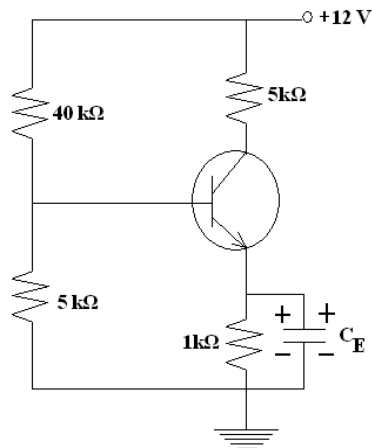


Fig. 3

- Q.9** a. Discuss the factors involved in the selection of I_C , R_C and R_E for a single-stage common-emitter BJT amplifier circuit using voltage-divider bias. (10)
- b. The gain of an amplifier without feedback is 100, whereas with negative feedback, it falls to 50. If due to ageing the amplifier gain falls to 80, find the percentage reduction in stage gain
 (i) without feedback (ii) with negative feedback. (6)