ROLL NO. _____

Code: DE52/DC52/DE102/DC102
Subject: FUNDAMENTALS OF ELECTRICAL & ELECTRONICS

DipIETE – ET/CS *{Current & New Scheme}*

Time: 3 Hours JUNE 2016 **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. The electrostatic force between two charges Q_1 and Q_2 placed at a distance 'r' from each other is given by

(A) $F = \dfrac{Q_1 Q_2}{4\pi\varepsilon_0 r}$ **(B)** $F = \dfrac{Q_1 Q_2}{\pi\varepsilon_0 r^2}$

(C) $F = \dfrac{Q_1 Q_2}{4\pi r^2}$ **(D)** $F = \dfrac{Q_1 Q_2}{4\pi\varepsilon_0 r^2}$

b. In a pure capacitive circuit, current flowing in the circuit leads the voltage applied to the circuit by.....

(A) 90^o **(B)** 180^o

(C) 270^o **(D)** 0^o

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 to safe values
(D) none of these

d. Synchronous speed N_S of the rotating magnetic field produced in the stator of 3-phase induction motor is

(A) $N_S = \dfrac{120P}{f}$ **(B)** $N_S = \dfrac{120f}{P}$

(C) $N_S = \dfrac{120P^2}{f^2}$ **(D)** $N_S = \dfrac{120f^2}{P^2}$

Where P = Number of poles and f = frequency of applied voltage.

e. The Direction of rotation for motor is given by

(A) Fleming's left hand rule **(B)** Faraday's law
(C) Kirchhoff's law **(D)** Ohm's law

f. When a trivalent impurity is added to an intrinsic semiconductor, it becomes
(A) an insulator **(B)** a conductor
(C) *p* - type semiconductor **(D)** *n* - type semiconductor

g. A zener diode is used as
(A) an amplifier **(B)** oscillator
(C) a multi-vibrator **(D)** a voltage regulator

h. For proper amplification by a transistor circuit, the quiescent point should be located at.....of the D.C. load line.
(A) the end (maximum voltage) point
(B) middle
(C) the maximum current point
(D) none of these

i. An oscillator differs from an amplifier because it.....
(A) requires no input signal **(B)** requires no d.c. supply
(C) has more gain **(D)** always has the same input

j. The forbidden energy gap in a semiconductor
(A) lies just below the valence band
(B) lies just above the conduction band
(C) lies between valence band and conduction band
(D) is same as the valence band

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

Q.2 a. State Faraday's laws of electromagnetic induction. **(4)**

b. Derive an expression for the current flowing at any instant during the discharge of the capacitor C across the resistor R. **(6)**

c. An iron ring of mean length 60 cm has an air gap of 2 mm. It is wound with 300 turns of wire. If the relative permeability of iron is 300 when a current of 0.7 A flows through the coil, find the flux density. **(6)**

Q.3 a. For the circuit shown in Fig.1 calculate the value of resistance '*r*' when the total current taken by the network is 1.5 A. **(8)**

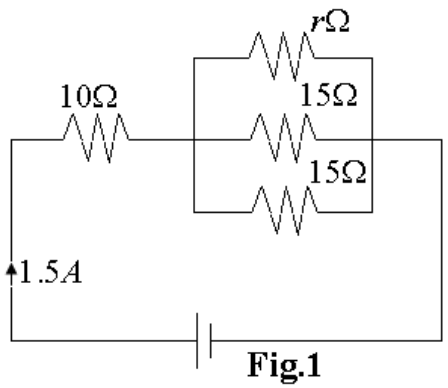

Fig.1

b. Derive an expression for the average value and rms value of an alternating current in terms of its maximum value. **(4+4)**

Q.4 a. Derive an expression for the torque developed by the armature of DC motor. **(8)**

b. A 4-pole dc shunt generator with lap-connected armature supplies a load of 100A at 200 V. The armature is 0.1 Ω and the shunt field resistance is 80 Ω. Find
(i) total armature current
(ii) current per armature path
(iii) emf generator **(3+3+2)**

Q.5 a. A 6600/400 V, 50 Hz, single phase core type transformer has a net cross-sectional area of the core of $428\,cm^2$. The maximum flux density in the core is 1.5 tesla. Calculate the number of turns in the primary and secondary windings. **(8)**

b. Explain principal of operation of 3-phase induction motor. **(8)**

PART B

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

Q.6 a. What is a *pn* junction? Describe the properties of *pn* junction. **(8)**

b. What is zener diode? Explain its working with the help of its V-I characteristics. **(8)**

Q.7 a. Draw the circuit diagram of a full wave rectifier using two diode and center-tapped transformer and explain its operation with the help of necessary wave form. **(8)**

b. Draw and explain DC voltage multiplexers circuit. **(8)**

Q.8 a. Sketch and explain the input and output characteristics of CB configurations of transistors. **(8)**

b. With the help of circuit diagrams, explain working of collector to base biasing circuits. What are its advantages and disadvantages? **(8)**

Q.9 a. What do you mean by negative feedback? Explain series voltage negative feedback with the help of suitable diagram. **(8)**

b. Draw circuit diagram of BJT Hartley oscillator and explain its working. **(8)**