

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

Time: 3 Hours

**DECEMBER 2010**

Max. Marks: 100

**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 half an hour 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. Coulombs law for the force between electric charges most closely resembles with

- (A) Newton's law of motion                      (B) law of conservation of energy  
(C) Gauss's theorem                              (D) Newton's law of gravitation

b. Resistivity of a wire depends on

- (A) length    (B) material  
(C) cross section area                              (D) none of the above

c. In three phase star connection, line voltage is the same as

- (A) phase voltage                                      (B)  $1/\sqrt{3}$  phase voltage  
(C)  $\sqrt{3}$  phase voltage                              (D) 3 x phase voltage

d. The speed of a D.C motor may be varied by varying

- (A) field current                                      (B) applied voltage  
(C) resistance in series with armature (D) any of the above

e. The difference between the synchronous speed and the actual speed of an induction motor is known as

- (A) regulation                                      (B) back lash  
(C) slip    (D) lag

f. In n-type semiconductor free electrons are the ----- carriers.

- (A) minority    (B) majority  
(C) magnetic    (D) neutral

- g. When reverse bias is applied to a junction diode
- (A) Minority carriers current is increased
  - (B) Majority carriers current is increased
  - (C) Potential barriers is lowered
  - (D) Potential barrier is raised
- h. Which of the following rectifier needs four diodes?
- (A) half wave rectifier
  - (B) centre tap full wave rectifier
  - (C) bridge rectifier
  - (D) none of the above
- i. Arrow head on a transistor symbol indicates
- (A) direction of electron current in emitter
  - (B) direction of hole current in emitter
  - (C) diffusion current in emitter
  - (D) drift current in emitter
- j. A Hartley oscillator circuit uses
- (A) capacitive feedback
  - (B) a tapped inductor
  - (C) a tapped capacitor
  - (D) a tapped inductor for inductive feedback

**PART A**

**Answer atleast TWO questions. Each question carries 16 marks.**

- Q.2** a. Derive the expression for the force on current carrying conductor in magnetic field. (8)
- b. The coil of a moving coil instrument is wound with 50 turns of wire. The flux density in the gap is  $0.06 \text{ wb/m}^2$  and the effective length of the coil side in the gap is 4 cm. Find the force acting on each side of the coil when the current is 40 mA. (8)
- Q.3** a. Define the following A.C quantities
- (i) R.M.S value of alternating current
  - (ii) Instantaneous value of alternating current.
  - (iii) Average value or mean value of alternating current
  - (iv) Amplitude (8)
- b. The equation of an alternating current is  $I = 42.42 \sin 628t$ . Calculate
- (i) its maximum value
  - (ii) its frequency
  - (iii) its R.M.S value
  - (iv) its average value (8)

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- Q.4** a. What are the different types of D.C motors? Give their applications. (8)
- b. The armature of a 4-pole, d.c shunt motor has a lap-connected armature winding with 740 conductors. The no load flux per pole is 30 mWb. If the armature current is 40A. Determine the torque developed? (8)
- Q.5** a. Explain the construction and principle of operation of a transformer. (8)
- b. A 3-phase, 50Hz induction motor has 8 poles. It runs at a speed of 700rpm. Determine
- (i) Synchronous speed
  - (ii) Slip
  - (iii) Rotor frequency at the time of starting
  - (iv) Rotor frequency at the given speed (8)
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**PART B**  
**Answer atleast TWO questions. Each question carries 16 marks.**

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- Q.6** a. Draw and explain the approximate equivalent circuit of a diode. (8)
- b. Explain the energy bands in solids. Also classify the materials based on the energy band and explain them. (8)
- Q.7** a. Explain zener diode voltage regulator circuit with no load. (8)
- b. The output voltage of a dc power supply changes from 20V to 19.7V, when the load is increased from zero to maximum. The voltage also increases to 20.2V when the a-c supply increases by 10%. Calculate the load and source effects? (8)
- Q.8** a. Name the different methods of transistor biasing. Mention the steps that are taken to design the transistor biasing circuits. (8)
- b. Give the comparison of 3 configurations (CB, CE & CC) of Bipolar transistor. (8)
- Q.9** Describe and explain BJT phase shift oscillator. (16)