ELECTRICITY AND ELECTRONICS

Maximum Marks: 80

Time Allowed: Three Hours

*(Candidates are allowed **additional 15 minutes** for **only** reading the paper. They must **NOT** start writing during this time.)*

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*Answer all questions in **Section A, Section B** and **Section C**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A – 16 MARKS

Question 1

(i) The waveform is adjusted on the screen of cathode ray oscilloscope by: **[1]**

(a) adjusting the grid voltage.

(b) using shift / position controls.

(c) reducing the grid current.

(d) using a galvanometer in the circuit.

(ii) Which one of the following is **NOT** a reason for a D.C. shunt generator failing to build up voltage? **[1]**

(a) Imperfect brush contact

(b) Faulty shunt connection tending to reduce residual magnetism

(c) No residual magnetism in the generator

(d) Field resistance is less than the critical resistance

(iii) Single phase induction motors can be made *self-start* machines by: **[1]**

(a) increasing their rotor resistance.

(b) using an external device.

(c) using an auxiliary winding.

(d) using a capacitor in series with stator winding.

(iv) The emitter-base junction must be _____ and base-collector junction be _____ for a transistor to work as an amplifier. [1]

(a) reverse biased, forward biased

(b) forward biased, forward biased

(c) reverse biased, reverse biased

(d) forward biased, reverse biased

(v) When a Zener diode is operated as a voltage regulator, there is a sudden increase in its current due to: [1]

(a) rupture of covalent bonds.

(b) rupture of ionic bonds.

(c) density of diode material.

(d) emf of the battery.

(vi) In *capacitor start* single-phase motors, _____. (current leads the voltage, current is in phase with the voltage) [1]

(vii) An ideal voltmeter connected to an electrical circuit provides a path for _____. (minimum current, minimum voltage) [1]

(viii) If the fourth band in a resistor is painted in golden colour, then its tolerance value is _____. (10%, 5%) [1]

(ix) A piezoelectric transducer works when _____ is applied to it. (heat, mechanical force) [1]

(x) Mention *any one* effect of *armature reaction* in motors. [1]

(xi) Match the devices given in **Column I** with their correct functions given in **Column II**. [4]

Column I	**Column II**
(a) DC generator	(1) Prevents electric shock when circuit is in 'off' state
(b) Zener diode	(2) Converts mechanical energy to electrical energy
(c) Bleeder resistor	(3) Converts sound energy to electrical energy
(d) Moving coil microphone	(4) Operates under breakdown voltage

(xii) State whether the following are True or False. [2]

(a) Forward biasing of p-n junction offers infinite resistance.

(b) In a D.C series motor, the graph of speed versus armature current will be a straight line.

SECTION B - 32 MARKS

Question 2 **[4]**

Name the *two* types of single-phase motors that are made to function as 'self start' machines. Briefly explain *any one* of these motors.

Question 3 **[4]**

A circuit diagram of a regulated power supply is shown below. Label the parts marked from 1 to 4 by using technical terms / names.

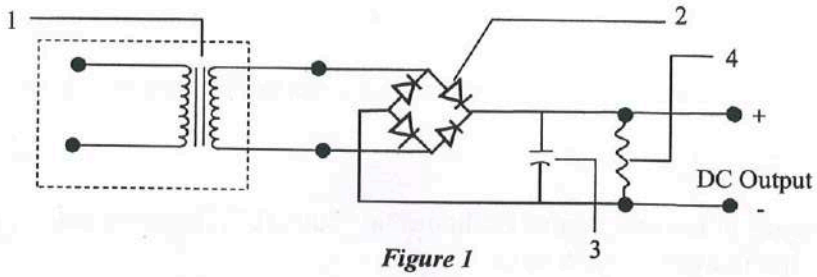


Figure 1

Question 4 **[4]**

Identify the devices whose output is represented by the following graphs marked A, B, C and D.

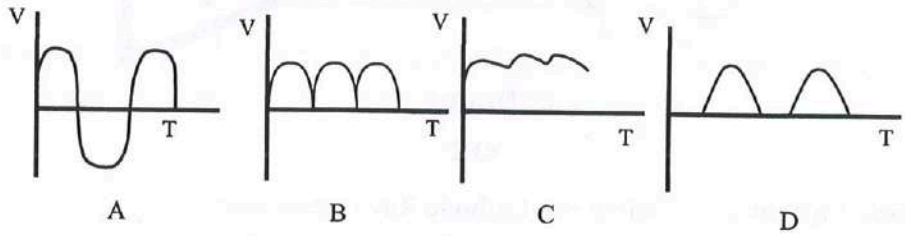


Figure 2

Question 5 **[4]**

Figure 3 given below shows a triode valve. State the function of each of the labelled parts.

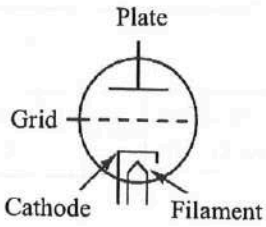


Figure 3

Question 6 **[4]**

Draw a neat and labelled diagram of a Full Wave Rectifier.

Question 7 **[4]**

Write the function of each of the following parts of a generator.

(i) Armature Windings

(ii) Poles

(iii) Commutator

(iv) Brushes

Question 8 **[4]**

(i) With reference to the diagram of Cathode Ray Tube (CRT) shown below, identify *any four* parts marked from A to G.

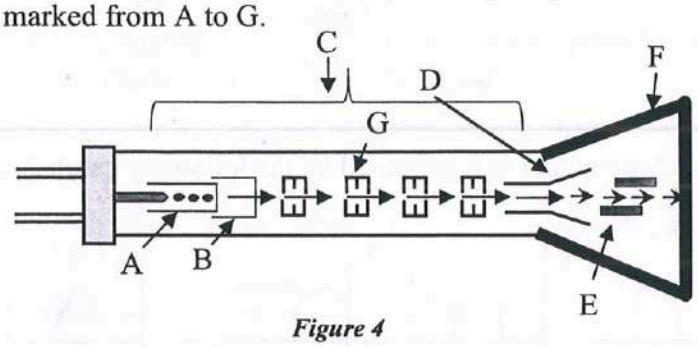


Figure 4

OR

(ii) The block diagram given below is a Cathode Ray Oscilloscope.

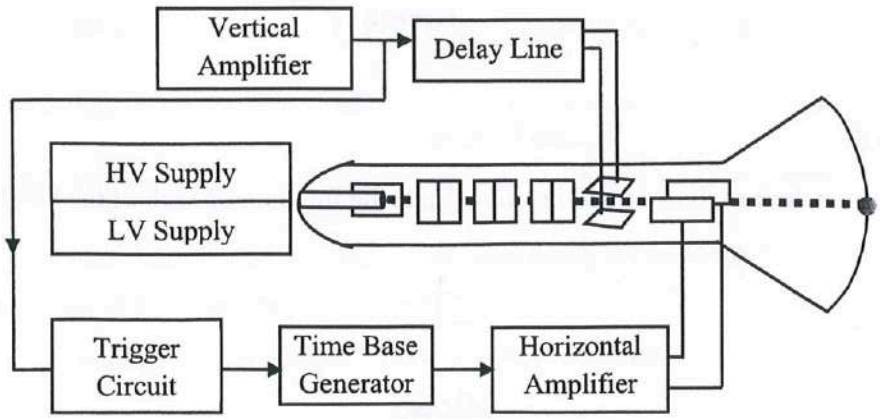


Figure 5

State the function of *any four* of the following in the working of an oscilloscope.

(a) Trigger circuit

(b) Horizontal amplifier

(c) Vertical amplifier

(d) Time base generator

(e) High Voltage supply

(f) Low Voltage supply

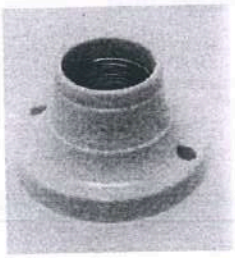
[4]

Question 9

(i) State *any one* use of each of the electrical accessories shown below.

(A)

(B)

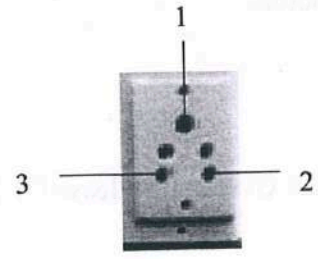


(C)

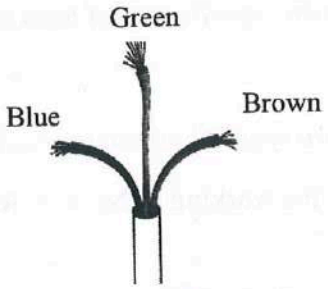
(D)

OR

(ii) Match the colour of the wires shown in (B) with markings 1, 2 and 3 shown in (A). State *any one* advantage of the stranded wires shown below.



(A)



(B)

SECTION C - 32 MARKS

Question 10

(i) Explain the process of distribution of electric power to houses. [4]

(ii) Explain the importance of fuse and trip in an electric circuit. [4]

Question 11

(i) Draw a neat and labelled diagram showing the working of a single stage RC coupled amplifier. Also, state the importance of an 'emitter bypass capacitor' in the circuit. [5]

(ii) Differentiate between Common-Emitter (CE) and Common Base (CB) on the basis of Current gain, Power gain and Phase shift. [3]

Question 12

(i) Compare Shunt and Series generator on the following basis:

(a) Circuit diagram [1]

(b) Voltage equation [1]

(c) Load characteristics with its axes labelled [2]

(d) Current equation [1]

(ii) Explain the significance of *back emf* in D.C. motors. [3]

OR

(i) Name *two* types of armature windings. [2]

(ii) Explain the working of No Volt Release Coil and Overload Release Coil in a D.C. motor. [4]

(iii) Briefly explain why a series motor develops a high starting torque when the machine is working. [2]

Question 13

(i) Draw a neat circuit diagram to study the characteristics of Common-Emitter (CE) circuit. **[4]**

(ii) With reference to semiconductors, briefly explain the following terms: **[4]**

(a) Extrinsic semiconductor

(b) Majority charge carriers

(c) Depletion region

(d) Peak inverse voltage