

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.)*

*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.

This Paper consists of 7 printed pages and one blank page.

- (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.

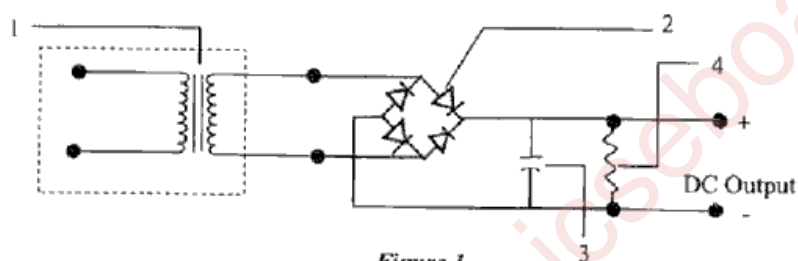


Figure 1

Question 4

[4]

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

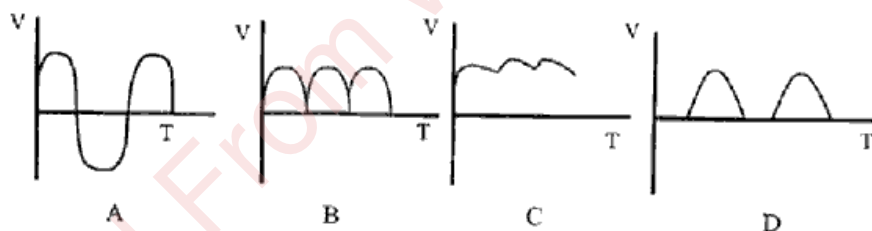


Figure 2

Question 5

[4]

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

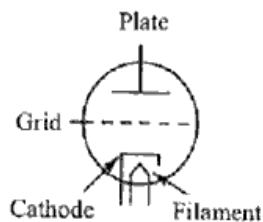


Figure 3

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.

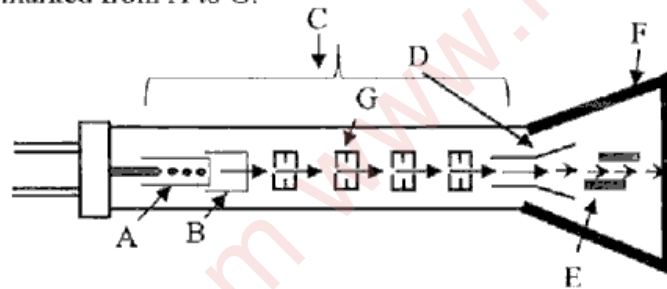


Figure 4

OR

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

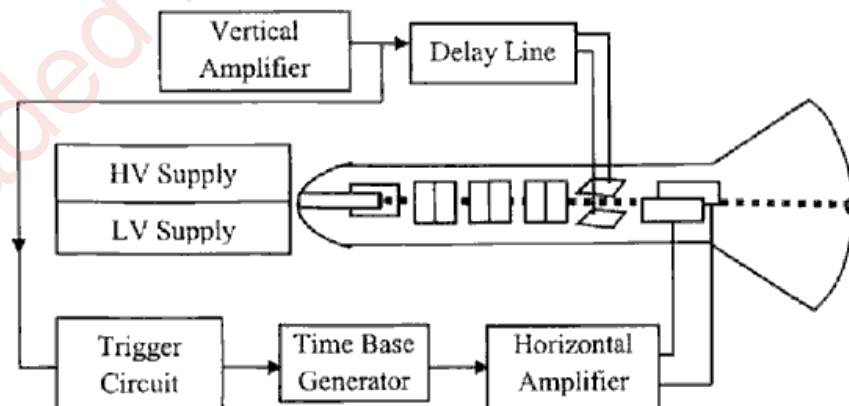


Figure 5

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

Question 9

[4]

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



(A)



(B)



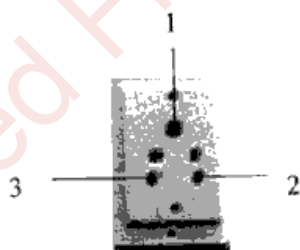
(C)



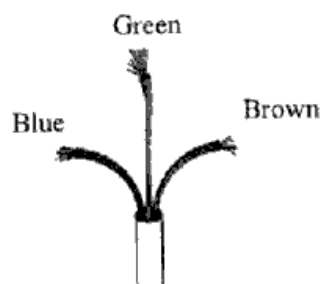
(D)

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