

**ISC SEMESTER 1 EXAMINATION
SPECIMEN QUESTION PAPER
ELECTRICITY & ELECTRONICS**

Maximum Marks: 80

Time allowed: One and a half hours

(Candidates are allowed additional 15 minutes for only reading the paper.)

ALL QUESTIONS ARE COMPULSORY

Each question / subpart of a question carries one mark.

Question 1

With reference to generator, in lap winding, the number of brushes is always:

- (a) Double the number of poles.
- (b) Same as the number of poles.
- (c) Half the number of poles.
- (d) Two.

Question 2

For starting a D.C. motor a 'starter resistor' is required because:

- (a) It limits the speed of the motor.
- (b) It limits the starting current to a safe value.
- (c) It starts the motor.
- (d) It limits the torque on the motor.

Question 3

In a 'capacitor start' motor, the phase displacement between starting and running windings can be nearly:

- (a) 10°
- (b) 30°
- (c) 60°
- (d) 90°

Question 4

Through which of the following systems can electric power be distributed?

- (a) Overhead system.
- (b) Underground system.
- (c) Both (a) and (b).
- (d) None of the above.

Question 5

Which of the following materials is not used for distribution of electrical power?

- (a) Copper
- (b) Aluminium
- (c) Steel
- (d) Tungsten

Question 6

A semiconductor diode has:

- (a) One p-n junction.
- (b) Two p-n junctions.
- (c) Three p-n junctions.
- (d) Four p-n junctions.

Question 7

If the arrow of crystal diode symbol is positive with reference to bar, then diode is _____ biased.

- (a) Forward
- (b) Reverse
- (c) Either forward or reverse
- (d) None of the above

Question 8

When the crystal diode current is large, the bias is:

- (a) Forward
- (b) Inverse
- (c) Poor
- (d) Reverse

Question 9

If the temperature of a crystal diode increases, then leakage current:

- (a) Remains the same
- (b) Decreases
- (c) Increases
- (d) Becomes zero

Question 10

Semiconductor diode is used as:

- (a) Oscillator
- (b) Amplifier
- (c) Rectifier
- (d) Modulator

Question 11

For controlling the initial inrush of current:

- (a) Reduced voltage is applied to the stator during the starting period.
- (b) Reduced voltage is applied to the stator when the motor is running at rated speed.
- (c) Either (a) or (b).
- (d) The number of turns in the stator coil are increased.

Question 12

A crystal diode has forward resistance of the order of _____.

- (a) $k\Omega$
- (b) Ω
- (c) $M\Omega$
- (d) $G\Omega$

Question 13

If the p type of the crystal diode is connected to the positive terminal of the battery, then this diode is:

- (a) Forward biased
- (b) Reverse biased
- (c) Both (a) and (b)
- (d) Unbiased

Question 14

The reverse current in a diode is of the order of _____.

- (a) kA
- (b) mA
- (c) μ A
- (d) A

Question 15

The forward voltage drop across a silicon diode is about:

- (a) 2.5 V
- (b) 3 V
- (c) 10 V
- (d) 0.7 V

Question 16

The D.C resistance of a crystal diode is _____ its A.C resistance.

- (a) The same as
- (b) More than
- (c) Less than
- (d) Equal to

Question 17

An ideal crystal diode is one which behaves as a perfect _____ when forward biased.

- (a) conductor
- (b) insulator
- (c) resistance material
- (d) none of the above

Question 18

The leakage current in a crystal diode is due to _____.

- (a) minority carriers
- (b) majority carriers
- (c) junction capacitance
- (d) none of the above

Question 19

If the temperature of a crystal diode increases, then leakage current _____.

- (a) remains the same
- (b) decreases
- (c) increases
- (d) becomes zero

Question 20

If the doping level of a crystal diode is increased, the breakdown voltage _____.

- (a) Remains the same.
- (b) Is increased.
- (c) Is decreased.
- (d) First increases and then gradually decreases.

Question 21

The knee voltage of a crystal diode is approximately equal to _____.

- (a) applied voltage
- (b) breakdown voltage
- (c) forward voltage
- (d) barrier potential

Question 22

When the crystal diode current is small, the bias is:

- (a) forward
- (b) inverse
- (c) poor
- (d) reverse

Question 23

A crystal diode is a _____ device.

- (a) non-linear
- (b) bilateral
- (c) linear
- (d) unilateral

Question 24

If the doping level in a crystal diode is increased, the width of depletion layer _____.

- (a) Remains the same.
- (b) Decreases.
- (c) Increases.
- (d) Initially increases and then abruptly decreases.

Question 25

The PIV rating of each diode means:

- (a) Reverse voltage
- (b) Forward voltage
- (c) Reverse safe voltage
- (d) Forward safe voltage

Question 26

If the PIV rating of a diode is exceeded:

- (a) The diode conducts poorly.
- (b) The diode is destroyed.
- (c) The diode behaves like a resistor.
- (d) The diode conducts heavily.

Question 27

Diode is made up of _____ material.

- (a) Conducting
- (b) Insulating
- (c) Semiconducting
- (d) Electronic

Question 28

Semiconductors are classified as _____.

- (a) Intrinsic semiconductors
- (b) Extrinsic semiconductors
- (c) Both (a) and (b)
- (d) None of the above

Question 29

Diode is a _____ device.

- (a) Unidirectional
- (b) Bidirectional
- (c) Non-linear
- (d) Both (a) and (c)

Question 30

Diode turns OFF if the applied voltage polarity is _____ the diode polarity.

- (a) Similar to
- (b) Matches
- (c) Same as
- (d) Opposite to

Question 31

A part of an electric circuit which is used to limit the amount of electric current flowing through the circuit is known as a:

- (a) Diode
- (b) Thermistor
- (c) Radiator
- (d) Resistor

Question 32

The capacitors which use chemical reactions to store charge are called:

- (a) Ceramic capacitors
- (b) Fixed capacitors
- (c) Parallel plate capacitors
- (d) Electrolytic capacitors

Question 33

The capacitor which has a dielectric between its plates and is made of a flexible material that can be rolled into the shape of a cylinder is called:

- (a) Ceramic capacitor
- (b) Fixed capacitor
- (c) Parallel plate capacitor
- (d) Electrolytic capacitor

Question 34

The figure 1 given below shows the symbol for:



figure 1

- (a) An air core.
- (b) A ferrite core.
- (c) An iron core.
- (d) None of the above.

Question 35

Why is the armature of a DC generator laminated?

- (a) To reduce the bulk.
- (b) To provide the bulk.
- (c) To insulate the bulk.
- (d) To reduce the eddy current loss.

Question 36

What are the field coils of a DC generator usually made up of?

- (a) Mica
- (b) Copper
- (c) Cast iron
- (d) Carbon

Question 37

A DC generator may lose a residual magnetism due to:

- (a) Heating
- (b) Vibrations
- (c) Over excitation
- (d) Any of the above

Question 38

If a D.C. motor is connected across the A.C. supply, it will:

- (a) Run at anormal speed.
- (b) Not run.
- (c) Run at a speed lower than the rated speed.
- (d) Burn due to heat produced in the field winding by eddy current.

Question 39

How can the speed of a D.C. shunt motor be increased?

- (a) By increasing the resistance in armature circuit.
- (b) By increasing the resistance in field circuit.
- (c) By reducing the resistance in the field circuit.
- (d) By reducing the resistance in the armature circuit.

Question 40

In a split-phase motor, the running winding should have:

- (a) High resistance and low inductance.
- (b) High resistance and High inductance.
- (c) Low resistance and high inductance.
- (d) Low resistance and low inductance.

Question 41

If the capacitor of a single-phase motor is short-circuited:

- (a) The motor will not start.
- (b) The motor will run in the same direction at a reduced speed.
- (c) The motor will run in the reverse direction.
- (d) None of the above.

Question 42

In a split-phase motor:

- (a) Both, starting and running windings are connected through a centrifugal switch.
- (b) Centrifugal switch is used to control supply voltage.
- (c) The running winding is connected through a centrifugal switch.
- (d) The starting winding is connected through a centrifugal switch.

Question 43

A shunt generator delivers 450 A at 230 V and the resistance of the shunt field and armature are $50\ \Omega$ and $0.03\ \Omega$ respectively. What will be the generated e.m.f?

- (a) 243.6 V
- (b) 243.06 V
- (c) 243 V
- (d) 240 V

Question 44

400 V DC shunt motor takes 5 A at no load ($R_a = 0.5\ \text{ohm}$, $R_f = 200\ \text{ohm}$). What is the difference between emf no - load and emf full - load when the DC shunt motor takes 50 A on full load?

- (a) 22.5 V
- (b) 22 V
- (c) 25 V
- (d) 23 V

Question 45

The material used for making the stator of an induction motor is:

- (a) copper
- (b) silicon steel
- (c) iron
- (d) gold

Question 46

What are the brushes of D.C. machines are made up of?

- (a) carbon
- (b) copper
- (c) zinc
- (d) Tungsten

Question 47

Inductors are _____ devices.

- (a) active
- (b) passive
- (c) non-linear
- (d) none of the above

Question 48

What happens to the speed of the D.C shunt motor if the load on it is increased?

- (a) It reduces slightly.
- (b) It increases slightly.
- (c) Initially it increases and then decreases.
- (d) Initially it decreases and then increases.

Question 49

The terminal voltage of a series generator is 150 V when the load current is 5 A. If the load current is increased to 10 A, then what will be the terminal voltage?

- (a) greater than 150 V.
- (b) less than 150 V.
- (c) exactly doubles.
- (d) exactly halved.

Question 50

Resistors are _____ devices.

- (a) polar
- (b) non- polar
- (c) non-linear
- (d) none of the above

Question 51

DC generator uses _____ to conduct current to the external circuit.

- (a) slip rings
- (b) split ring
- (c) both (a) and (b)
- (d) brushes

Question 52

AC generator uses _____ to conduct current to the external circuit.

- (a) slip rings
- (b) split ring
- (c) both (a) and (b)
- (d) brushes

Question 53

Single phase A.C motor works when _____ is given as input.

- (a) A.C
- (b) D.C
- (c) both A.C and D.C
- (d) none of the above

Question 54

The energy conversion in a loud speaker is:

- (a) Sound energy to electrical energy.
- (b) Electrical energy to sound energy.
- (c) Mechanical energy to sound.
- (d) Both (a) and (b).

Question 55

D.C motor converts:

- (a) A.C to D.C voltage
- (b) D.C to A.C voltage.
- (c) mechanical energy to electrical energy
- (d) electrical energy to mechanical.

Question 56

Boron is a _____.

- (a) Trivalent atom.
- (b) Pentavalent atom.
- (c) Tetravalent atom.
- (d) Hexavalent atom.

Question 57

SI unit of inductor is:

- (a) henry
- (b) farad
- (c) tesla
- (d) weber

Question 58

Overload release coil is used as _____ in a D.C motor.

- (a) Protective device.
- (b) Supporting device.
- (c) Heating device.
- (d) Voltage stabilising device.

Question 59

Resistors are:

- (a) Passive components
- (b) Active components
- (c) Non-linear components
- (d) All of the above

Question 60

A diode has:

- (a) only p-region
- (b) only n-region
- (c) both p-region and n-region.
- (d) none of the above

Question 61

The circuit shown in figure 2 below is a simple diagram of an 'inductor start' motor.

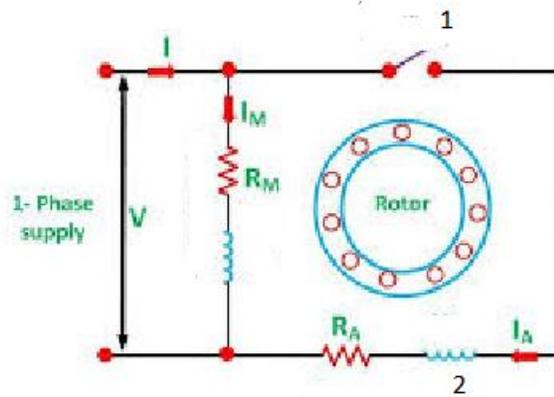


figure 2

- (i) The component labelled 1:
 - (a) Switch
 - (b) Two way switch
 - (c) Centrifugal switch
 - (d) None of the above
- (ii) The component labelled 2:
 - (a) Auxiliary winding
 - (b) Main winding
 - (c) Resistor
 - (d) Transformer

Question 62

Figure 3 given below is a diagram of a semiconductor diode. Choose the correct option to label markings 1 to 5.

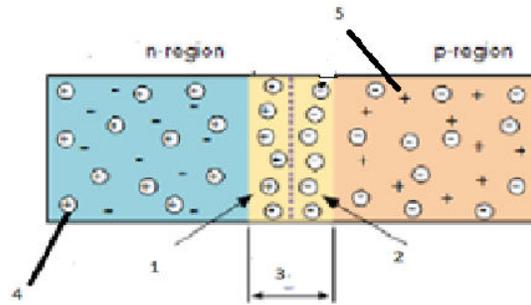


figure 3

- (i) Label 1:
 - (a) Positive ion
 - (b) Hole
 - (c) Boron atom
 - (d) None of the above
- (ii) Label 2:
 - (a) Positive ion
 - (b) Negative ion
 - (c) arsenic atom
 - (d) None of the above
- (iii) Label 3:
 - (a) Depletion region
 - (b) Saturated region
 - (c) Region with large number of charge carriers
 - (d) Diffusion region
- (iv) Label 4:
 - (a) Positive ion
 - (b) hole
 - (c) indium atom
 - (d) none of the above

- (v) Label 5:
- (a) minority charge carriers
 - (b) majority charge carriers
 - (c) immobile charges
 - (d) germanium atom

Question 63

The graph in figure 4 given below shows that the semiconductor diode is _____ biased.

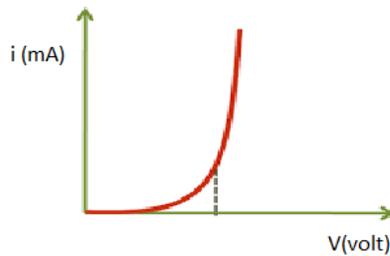


figure 4

- (a) Forward biased
- (b) Reversed biased
- (c) Unbiased
- (d) None of the above

Question 64

Answer the following question with reference to vacuum diode.

- (i) What is the terminal which is close to heater circuit called?
 - (a) Plate
 - (b) Cathode
 - (c) grid
 - (d) none of the above
- (iii) In 'space charge limited region':
 - (a) Plate current increases as plate voltage increases
 - (b) Plate current decreases as plate voltage increases
 - (c) Plate current remains constant as plate voltage decreases.
 - (d) Plate current becomes erratic as plate voltage increases.

Question 65

Choose the correct option to replace the underlined word.

- (i) The insulation colour used for 'Live' wire is yellow.
- (a) red
 - (b) black
 - (c) orange
 - (d) green
- (ii) Minority charge carriers in a p type semiconductor are holes.
- (a) Electrons
 - (b) Indium atom
 - (c) Positive ions
 - (d) Negative ions
- (iii) Arsenic has six electrons in their outer most orbit.
- (a) Five
 - (b) Four
 - (c) Three
 - (d) None of the above
- (iv) Forward biasing of p-n junction offers infinite resistance.
- (a) 100 kilo ohm resistance
 - (b) Almost Zero resistance
 - (c) 10 kilo ohm resistance
 - (d) None of the above
- (v) Resistor dissipate electric charge.
- (a) Power
 - (b) Electrical energy
 - (c) Current
 - (d) Voltage

Question 66

Figure 5 given below showing the circuit diagram is a motor starter with a protective device with parts labelled as I to V.

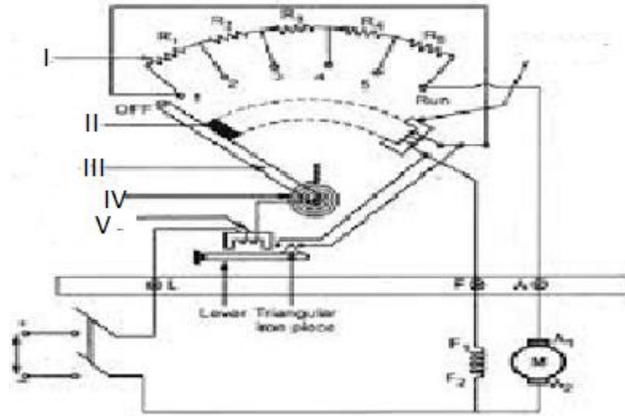


figure 5

Identify the parts:

- (i) Labelled I
 - (a) starter resistor
 - (b) resistor for running the motor
 - (c) resistor in parallel to the motor
 - (d) all of the above
- (ii) Labelled II
 - (a) soft iron
 - (b) glass
 - (c) wood
 - (d) Steel
- (iii) Labelled III
 - (a) wooden keeper
 - (b) magnetic keeper
 - (c) rubber plank
 - (d) conducting rod

(iv) Labelled IV

- (a) coil
- (b) spiral spring
- (c) supporting frame
- (d) torsion spring

(v) Labelled V

- (a) low volt release coil
- (b) overload release coil
- (c) supporting coil
- (d) transformer.