

Winter – 15 EXAMINATION

Subject Code: **17524**

Model Answer

Page No: 1/22

Important Instructions to examiners:

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

		Marks
1. A) Attempt any three :		12
a) Define : 1) amplitude 2) cycle 3) form factor 4) peak factor		4
Answer: Definition: (<i>1 mark for each definition</i>)		
1) Amplitude: It is the maximum absolute value of a periodically varying current or voltage.		4
2) Cycle: A complete reversal of alternating current passing through a complete set of change or motions in opposite direction is called as a cycle.		
OR		
A complete positive & a complete negative alternation of current & voltage is called cycle.		
3) Form factor: It is the ratio of RMS value to the average value.		
4) Peak factor: It is the ratio of peak value of any alternating current or voltage to RMS value.		
b) With the help of neat diagram explain concept of single turn alternator.		4
Answer: Concept of single turn alternator: (<i>diagram-2marks, explanation-2marks</i>)		
It consist of single rectangular coil A,B,C,D which rotated in circular motion with angular velocity ω rad/sec in uniform magnetic field C_1 and C_2 are two slip ring connected to the ends of coil. P and Q are two carbon brushes that are in contact with slip rings using spring tension. R is external load resistor.		2
Working:		
The alternator works on principal of faradays law of electromagnetic induction. It state that an alternating voltage can be generated:		
By rotating coil at constant angular velocity in uniform magnetic field.		
By rotating a magnetic field at constant angular velocity around a stationary coil.		
In both cases the generated voltage is sinusoidal in nature. The magnetite of generated voltage depends up on number turn in coil, strength of magnetic field and speed of rotation. The output voltage is given by-		
$V = N\phi_m \times \sin Wt$		
N = no. of turns in coil		
ϕ_m = maximum flux		
W = angular velocity		

Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 2/22

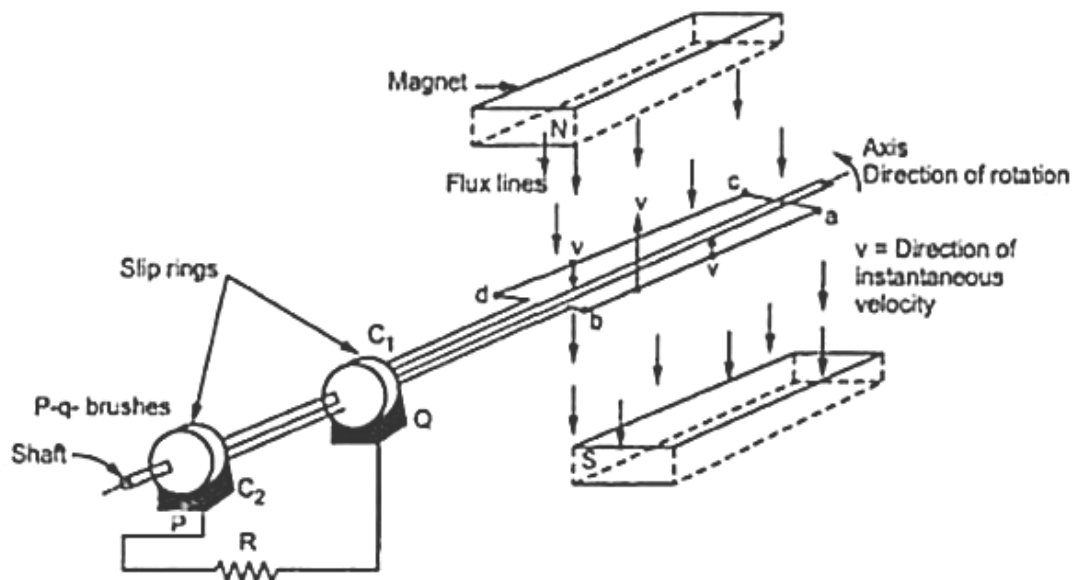


Fig : Single turn alternator

c) Explain insulated and ground return system.

Answer: Insulated and ground return system: (Insulated return system-2marks, ground return system -2marks)

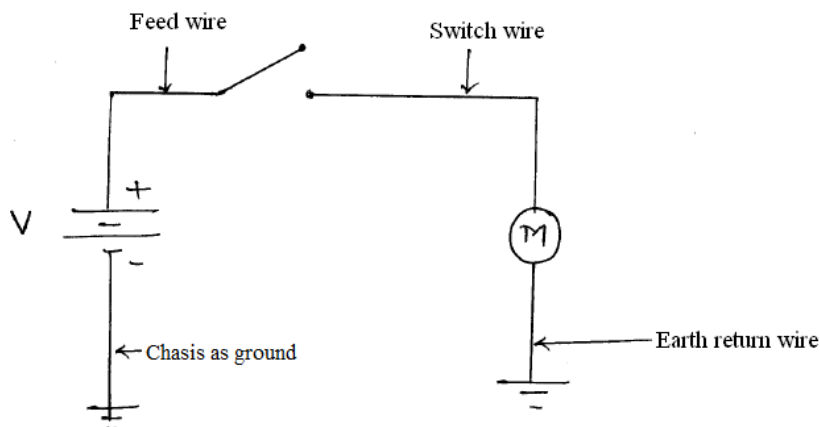


Fig (a) Ground Return system

Ground return system: In ground return system the metal chassis of the vehicle can be use as one of the two conducting path. A live feed wire cable forms the other conductor to complete the ground return path one end of a short thick cable is bolted to the chassis while the other end is at attached to the battery terminal. Only one battery to chassis conductor is necessary for completing the wiring system. Ground return system reduces & simplifies the amount of wiring and it easy to trace electric fault.

Insulated return system: Some vehicle application required a separate insulator cable for both feed and return conductor. It is also safer to use a separate cable for feed and return as it prevents safety from electrical short circuit. Insulated return system is essential from safety point of vehicle carrying flammable liquid, where a spark can set of explosion.

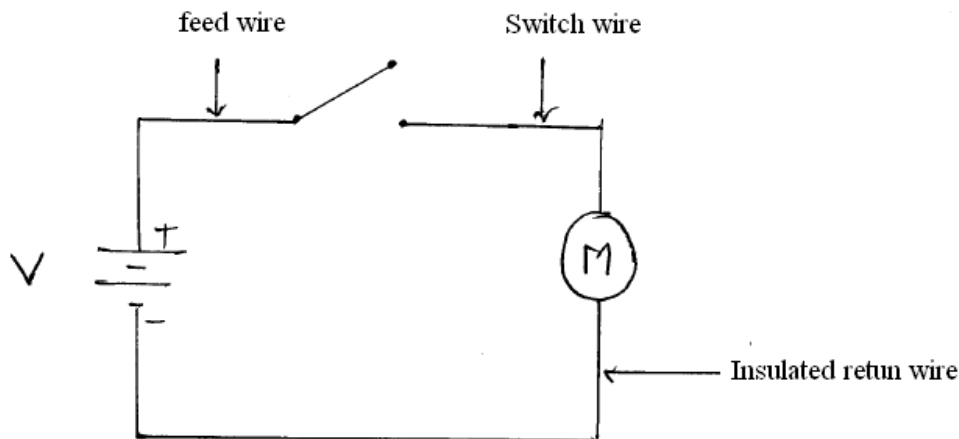


Fig: (b) Insulated return system

d) State difference between intrinsic and extrinsic semiconductor.

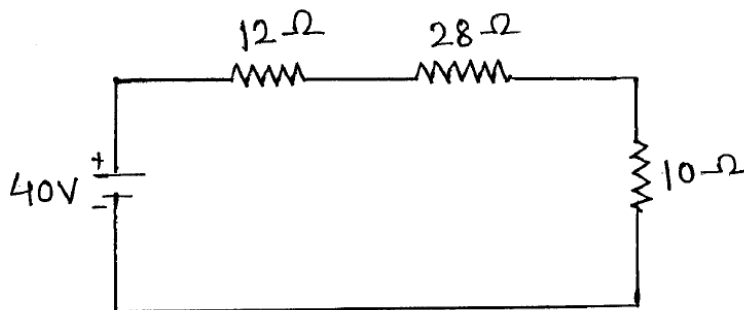
Answer: Difference between intrinsic and extrinsic semiconductor: (Any 4 points- 01 mark each):

Parameter	Intrinsic	Extrinsic
Purity	Extremely pure	Not Pure
Doping	Not done	Is done
No. of electrons & holes	No. of electrons is always equal to numbers of holes.	They are never equal to each other.
Conductivity	Poor	Much higher

B) Attempt any one:

a) Two resistances of $12\ \Omega$ and $18\ \Omega$ are connected in series and the combination is connected in series with a $10\ \Omega$ resistance. If this combination of resistors is put across 40V d.c. supply, find the current in $12\ \Omega$ and $18\ \Omega$ resistors.

Answer:



Two resistance of $12\ \Omega$ and $28\ \Omega$ are connected in series

\therefore The series combination is given by

$$\begin{aligned}\text{Resistance}_{\text{Series}} &= 12+18 \\ &= 40\ \Omega\end{aligned}$$

Winter – 15 EXAMINATION

Subject Code: **17524**

Model Answer

Page No: 4/22

The Resistance ^{Series} combination is in series with 10Ω

\therefore The total resistance combination is given as

$$R_{Total(series)} = 40 + 10 \\ = 50\Omega$$

Using ohm's law

The current is given by

$$I = \frac{V}{R} \\ = \frac{40}{50} \\ I = 0.8A$$

So current in 12Ω and 28Ω is $0.8A$.

b) With the help of neat diagram explain the wiring of headlight and turn indicator and their function.

Answer: (Diagram- 1mark, explanation-2marks)- Each

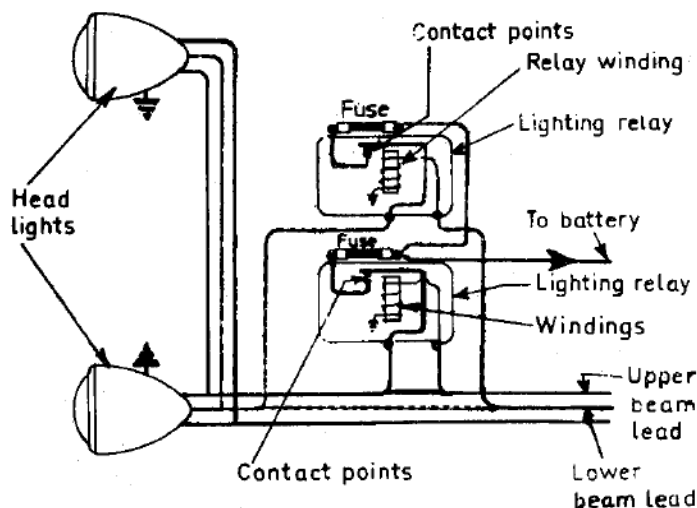


Fig : Head light

1. Head light: The lighting relay connect the lights directly to the battery through the relay points, thus eliminating the lighting switch and the wiring from the light circuit. This impresses a higher voltage at the light and thus brighter lights can be obtained. Figure shows the circuit diagram of headlights having lighting relays both in the lower beam and the upper beam.

Function: Head lights are used to focus an object on the road ahead. They illuminate the road ahead at reasonable distance with sufficient intensity.

2. Turn indicator Figure shows the circuit diagram of direction indicator. When the signal lever is moved one or the other way, the circuit is completed between the battery and the proper indicating lights on the front and the rear of the vehicle as well as on the dash board are illuminated. The circuit is completed through a flasher unit which is a device that closes and opens the circuit about 70 to 80 times per minute. This sends a flashing signal which is more noticeable than a steady light.

Function: The direction indicators permit the driver to signal his intention to make a right or a left turn.

Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 5/22

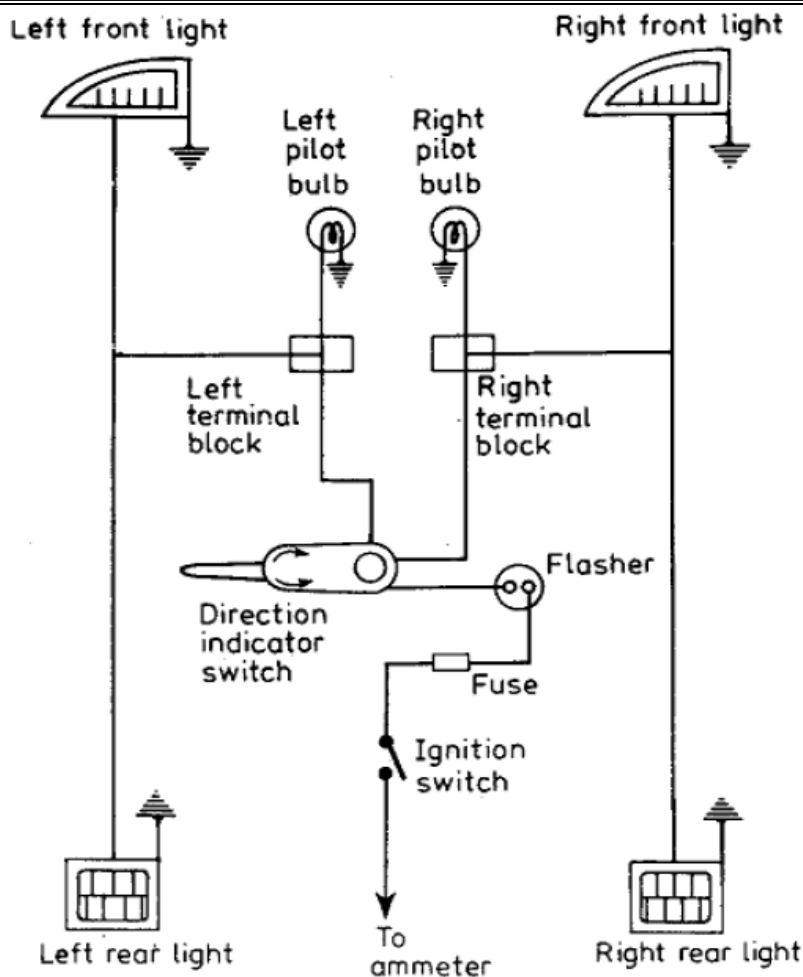


Fig : Turn indicator

2. Attempt any four:

- a) With the help of neat sketch diagram. Explain self -inductance and mutual inductance.

Answer: (Concept- 2Marks and diagram- 2 Marks)

Self-inductance: The property of the coil due to which it opposes any increase or decrease of flux through it, is known as self-inductance. Consider a coil of wire similar to the one shown in fig. connected to a battery through a rheostat, it is found that whenever an effort is made to increase current through it, it is always opposed by the instantaneous production of counter e. m. f. of self-induction. If now an effort is made to decrease the current, then again it is delayed due to the production of self-induced e. m. f., this time in opposite direction.

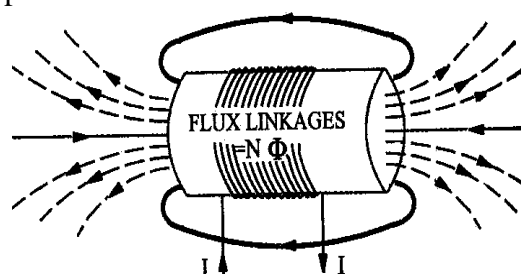


Fig Self-inductance

Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 6/22

Mutual inductance: If any change of current in coil A is always accompanied by the production of mutually induced e.m.f. in coil B. Mutual inductance may, therefore, be defined as the ability of one coil to produce an e.m.f. in a nearby coil by induction when the current in the first coil changes. This action being reciprocal, the second coil can also induce an e.m.f. in the first when current in the second coil changes. This ability of reciprocal induction is measured in terms of the coefficient of mutual induction M.

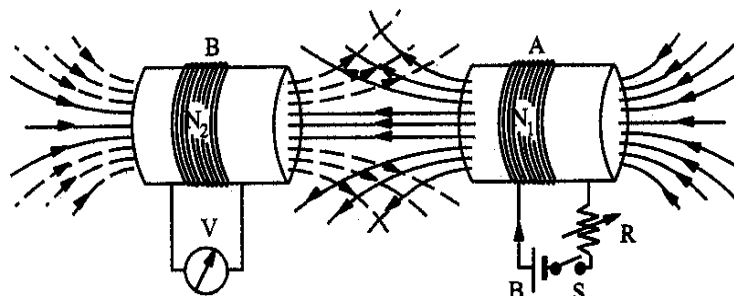
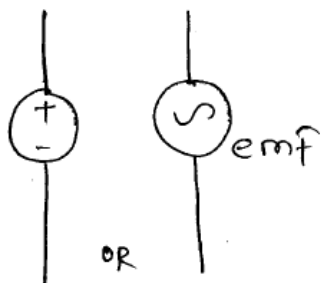


Fig : Mutual inductance

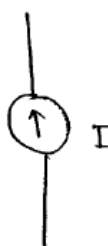
b) Define and draw symbols of EMF, Current, Resistance and Capacitance.

Answer: Definition: (Definition -1/2 mark , Symbol- 1/2 mark each)

- 1) **Emf:** It is the force which creates potential difference across the terminals, by a source of electrical energy, to produce an electric current in a circuit.
- 2) **Current:** It is defined as the rate of transfer of electric charge per unit time or current is flow electrons.
- 3) **Resistance:** It is a property of substance by virtue of which it opposes the flow current through it.
- 4) **Capacitance:** It is opposition to voltage changes in an a.c. circuit causing voltage to lag behind current.



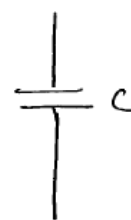
1) Emf



2) Current



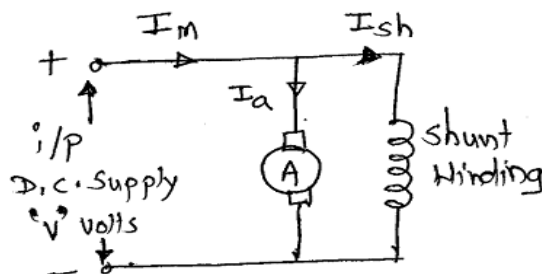
3) Resistor



4) Capacitor

c) Draw labeled diagram and DC shunt motor. State its two applications.

Answer: (Diagram- 2 marks, any two application- 2 marks)



D.C. shunt motor



Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 7/22

- Applications:** 1) centrifugal pumps
2) Machine tools
3) Blowers and fans
4) Reciprocating pumps

2

d) Explain working of SCR and draw its characteristics. (V-I)

4

Answer: (working- 2marks, characteristic- 2marks)

Working of SCR: An SCR has two states that is either it does not conduct or it conducts heavily. Therefore SCR behaves like a switch. There are two methods to turn on SCR. First to keep the Gate open and make the supply voltage equal to the break over voltage. The second is to operate SCR with supply voltage less than break over voltage and then turn it on by means of small voltage, applied to the Gate. Applying small positive voltage to the gate is the normal way to close an SCR because the break over voltage is usually much greater than the supply voltage. To open SCR, reduce the supply voltage to zero.

1

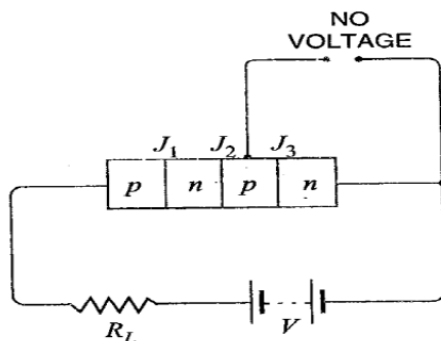


Figure. Without gate voltage

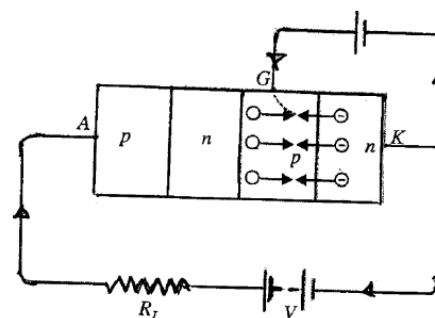
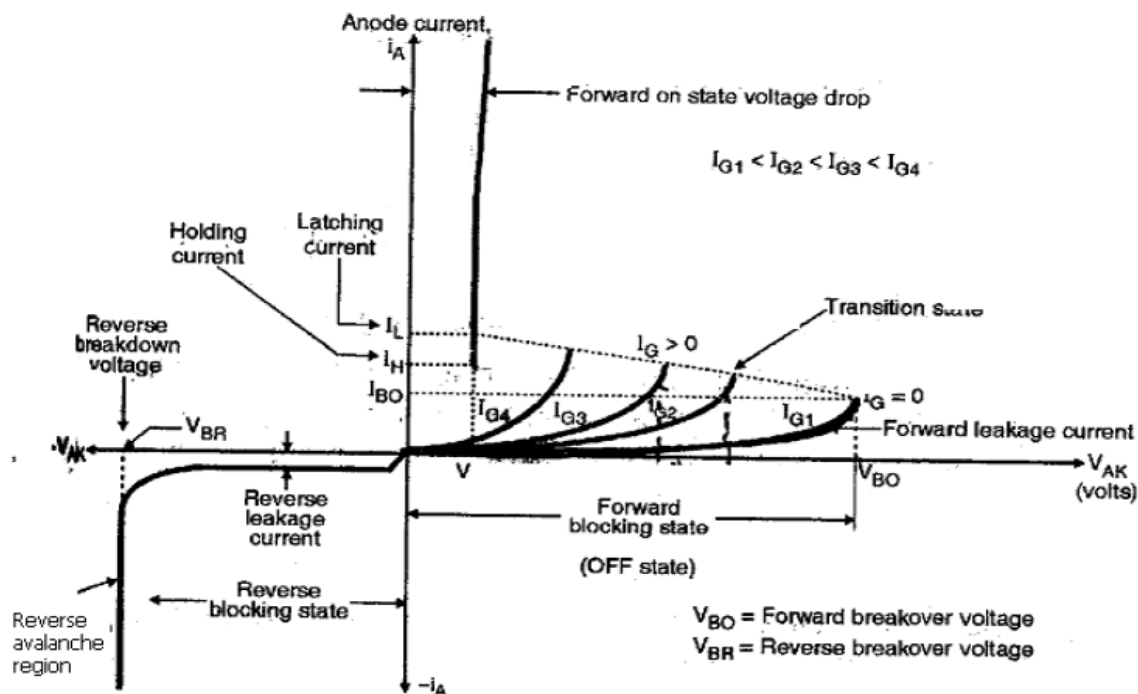


Figure: With gate voltage

1



2

Fig : VI characteristics of SCR



Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 8/22

e) What is difference between LVDT and RVPT, give any four point.

4

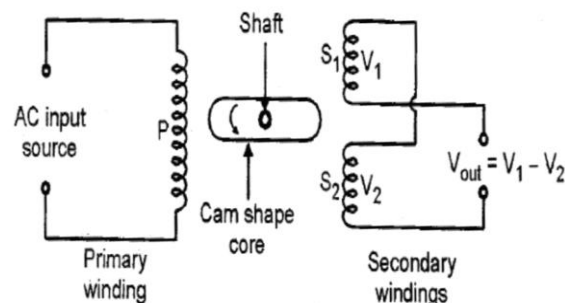
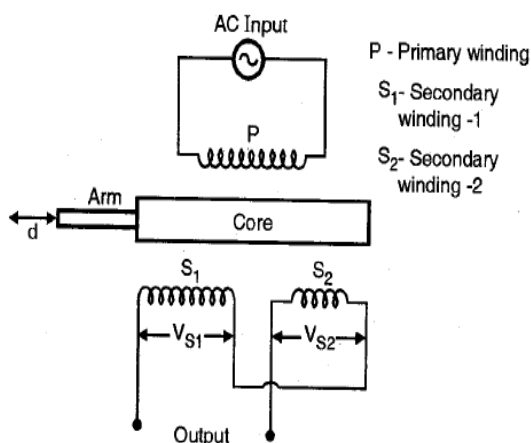
Answer: Difference between LVDT and RVDT: (1 mark for each)

Sr. No	LVDT(Linear Variable Differential Transformer)	RVDT(Rotary Variable Differential Transformer)
1.	It is used for measuring linear displacement.	It is used for measuring angular displacement
2.	Core is cylindrical shaped and moves linearly between windings.	Core is cam shaped and rotates between windings.
3.	The displacement to be measured is applied to an arm which is attached to the core.	The displacement to be measured is applied to the shaft which is attached to the cam shaped core.

4

4. Electrically Equivalent diagram.

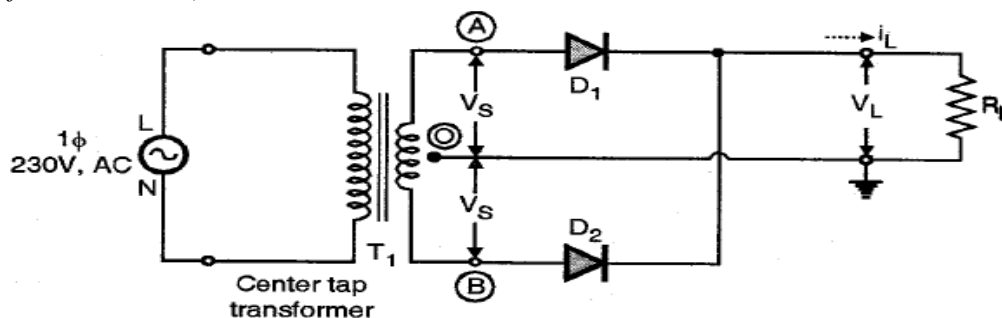
Electrically Equivalent diagram.



f) With the help of diagram, explain working of FWR. Also draw relevant waveform.

4

Answer: Circuit diagram of Full wave rectifier (FWR): (circuit diagram-1mark, explanation - 2marks, Waveform- 1 marks)



1

Fig :Full wave rectifier

Working of Full wave rectifier (FWR) :

The circuit employs two diodes D_1 and D_2 and as shown in figure. A center tapped secondary winding AB is used with two diodes connected so that each uses one half cycle of input a.c. voltage. In other words, diode D_1 utilizes the a.c. voltage appearing across the upper half (OA) of secondary winding for rectification, while diode D_2 uses the lower half winding OB. In positive half cycle diode D_1 is forward biased while D_2 is reverse biased, the load current starts flowing from A- D_1 - R_L -O. The instantaneous load voltage is positive. In negative half cycle diode D_2 is forward biased while D_1 is reverse biased the load current starts flowing from B- D_2 - R_L -O. The instantaneous load voltage is

2



Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 9/22

positive. Thus load voltage and load current both are positive in both the half cycle of a.c. supply and output voltage is obtained in both the half cycle.

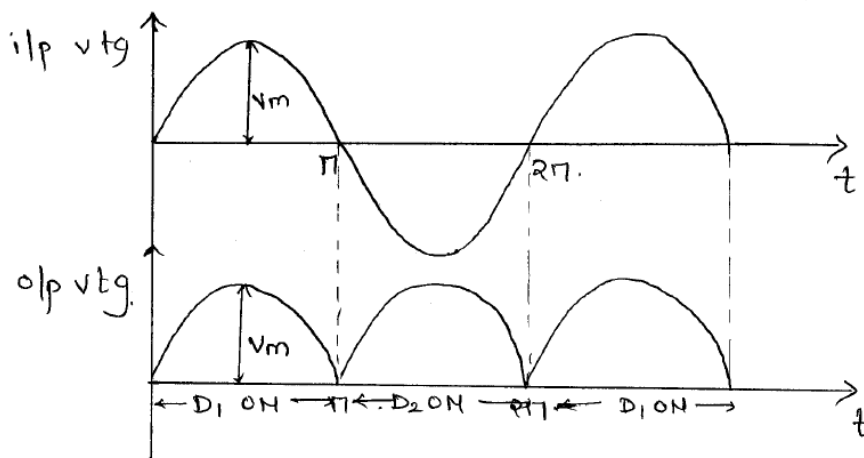


Figure: Waveform of Full wave rectifier

Note: Bridge rectifier can also be considered

3. Attempt any four:

a) Define : a) Sensitivity b) Resolution c) Linearity d) repeatability

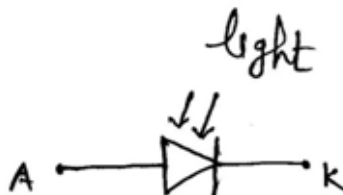
Answer: Definition: (1 mark each)

- a) **Sensitivity:** Sensitivity of an instrument is defined as the ratio of change in output to change in input.
- b) **Resolution:** Resolution is defined as the smallest change of input for which there will be a change of output.
- c) **Linearity:** Linearity is defined as the ability to reproduce the input characteristics symmetrically and linearly.
- d) **Repeatability:** Repeatability is the property of instrument to give the same output value each time the measurement of a given quantity is repeated under the same conditions

b) Draw symbol of photodiode and LED also state two application each.

Answer: (Symbol -1 Mark each & Two Applications – 1 Mark each)

Symbol of Photo diode:



Applications of Photodiode: 1) It is used in Alarm circuits. 2) It is used in Counter circuit.

Symbol of LED:



Applications of LED: 1) It is used in opto couplers. 2) It is used in 7 segment displays.



Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 10/22

c) Draw symbols of NOR and NAND gate also draw truth table for each.

4

Answer: (Symbol- 1 mark each, Truth table – 1 Marks each)

1) NAND gate:

Symbol:

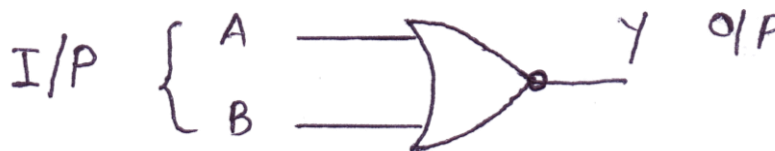


Truth table:

Inputs		Output
A	B	$Y = \overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0

2) NOR gate:

Symbol:



Truth table:

Inputs		Output
A	B	$Y = \overline{A + B}$
0	0	1
0	1	0
1	0	0
1	1	0

d) State Fleming's right hand rule left hand rule.

4

Answer:

Fleming's right hand rule: When the thumb & first two fingers of the right hand be arranged in right angles with each other .The first finger point in the direction of lines of force, and the outstretched thumb point the direction of conductor motion. Then the second finger indicates the direction of induced e.m.f.

2

Fleming's left hand rule - If the thumb, fore-finger and middle finger of left hand are stretched perpendicular to each other, if fore finger represents the direction of magnetic field, the middle finger represents the direction of current, then the thumb represents the direction of force.

2

Winter – 15 EXAMINATION

Subject Code: 17524

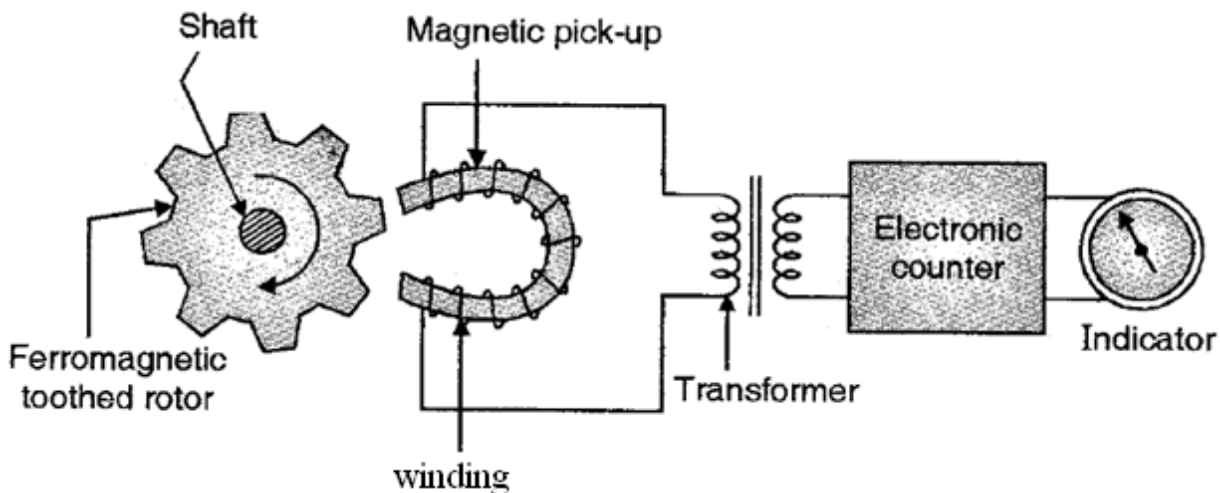
Model Answer

Page No: 11/22

e) With neat sketch diagram explain contactless type inductive tachometer.

4

Answer: Contactless type inductive tachometer: (diagram- 2marks, explanation -2 marks)



2

Figure shows construction of inductive tachometer. This tachometer generator consists of a metallic tooth rotor mounted on the shaft whose speed is to be measured. A magnetic pick up is placed near the toothed rotor. The magnetic pick up consists of a housing containing a small permanent magnet with a coil wound round it. When the rotor rotates the reluctance of the air gap between pick up and the toothed rotor changes giving rise to an induced e.m.f. in the pick- up coil. This output is in the form of pulses with a variety of wave shapes. The frequency of the pulses of induced e.m.f. will depend upon the number of teeth of the rotor and its speed of rotation i.e. the output frequency of magnetic pick up is given by

2

$$f = \frac{N(\text{Speed in rpm}) \times T}{60}$$

Where,

f= Output pulses per seconds (frequency)

N= Speed

T= Number of teeth on gear

Since the number of teeth is known the speed of rotation can be determined by measuring the frequency of pulses with an electronic counter i.e.

$$N = \frac{f \times 60}{T}$$

A typical rotor has 60 teeth thus if the counter counts the pulses in one seconds, the counter will directly display the speed in rpm. The tachometer is always connected to an electronic counter as said earlier whose requirement is merely the amplitude be great enough trigger a count.

4. A) Attempt any three

12

a) Compare core type and shell type transformer.

4

Winter – 15 EXAMINATION

Subject Code: **17524**

Model Answer

Page No: 12/22

Answer: Comparison: (any four points- 1 mark each)

Sr.	Core type transformer	Shell type transformer
1.	It provides a single magnetic circuit.	It provides a double magnetic circuit.
2.	Both the winding are uniformly distributed over two limbs of the core.	The core nearly surrounds the winding place on central limbs on the core.
3.	The Core has only one window.	The Core has Two window.
4.	Windings Encircle the core.	Core encircle the Windings.
5.	Cylindrical winding are used.	Sandwich winding are used.
6.	Cooling is better.	Cooling is not good as compared to shell type
7.	Less mechanical protection to the windings (coils).	Better mechanical protection to the windings (Coils).
8.	Easy to repair.	It is not so easy to repair.
9.	High efficiency.	Low efficiency.

b) What are the advantages of positive return wiring system?

Answer: Advantages of positive return wiring system: (Any four - 1 mark each)

- 1) It requires low spark plug voltage.
- 2) It reduces battery terminal corrosion.
- 3) It has less wear at plug point.
- 4) The temp of spark plug electrode is less.
- 5) Mostly used in ignition system.
- 6) More economical.

c) Explain working of ultrasonic flow meter.

Answer: Working of ultrasonic flow meter:

Ultrasonic flow meter based on Doppler effect is explained here.

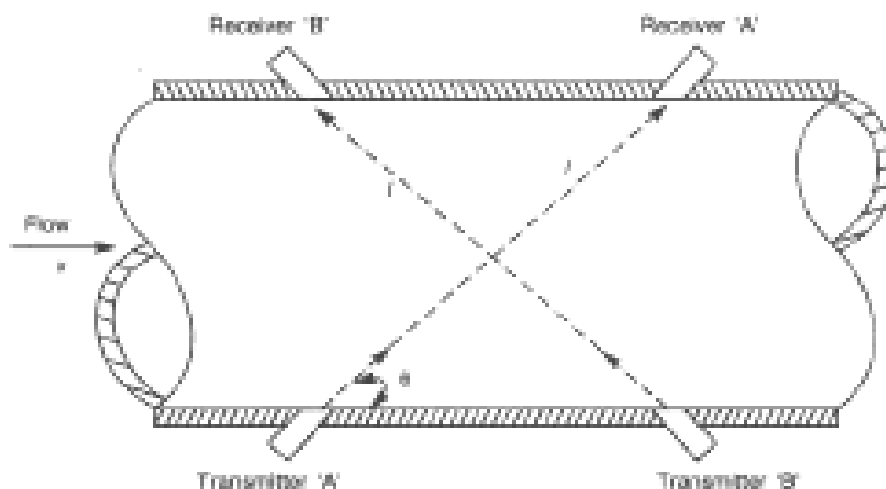


Fig Ultrasonic flow meter

A and B are Piezo -electric devices transmitting the short duration ultrasonic signals through the fluid that is flowing through the pipe at a velocity V. Similar type of crystals are used as receivers to respond to pressure fluctuations.



Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 13/22

Due to the fluid velocity v aiding the transmission the velocity of ultrasonic signal from the transmitter A to receiver A is increased to a value $c + v \cos \theta$, where c is the velocity of sound through the fluid in the pipe and θ is the angle between the path of sound and the pipe vale. The repetition frequency of the received pulse f_A will be

$$f_A = \frac{c + v \cos \phi}{l}$$

Where l = the distance between the transmitter and receiver. On the other hand the velocity of the ultrasonic signal transmitted by B and received by receiver B will be reduced by the fluid velocity causing a retardation of $v \cos \theta$ and its pulse repetition frequency f_B will be

$$f_B = \frac{c - v \cos \phi}{l}$$

The difference between frequencies is given by

$$\Delta f = f_A - f_B = \frac{2v \cos \phi}{l}$$

By measuring the difference in the repetition frequency Δf and knowing the values of θ and l the velocity of the fluid can be computed alternatively, the flow velocity can be computed by measuring the transit time difference between the two pulse trains in either direction.

d) The no of turns of CV winding of 150 KVA, 50 Hz and 115V/230V IQ transformer is 36, calculate:
1) Peal value of Q_m 2) IFL on LV side 3) No. of turns on HV side.

Answer: Given:

Primary turns = $N_1 = 36$

KVA = 150

Primary voltage $V_1 = 115V$

Secondary voltage = 230 V

Frequency $f = 50\text{HZ}$

From E.M.F. equation of transformer,

$$E_1 = V_1 = 4.44f\phi_m \times 36$$

$$= 115 = 4.44 \times 50 \times \phi_m \times 36$$

Peak value of $\phi_m = 0.01439\text{Wb}$ -----2marks

We know KVA rating equation,

$$KVA = \frac{(V_1 \times I_1)}{1000}$$

Full load primary current that is

IFL on LV side, $I_1 = 1304.35A$ -----1 mark

Transformation Ratio,

$$K = \frac{V_2}{V_1} = \frac{N_2}{N_1}$$

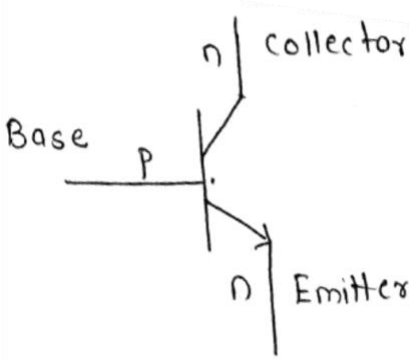
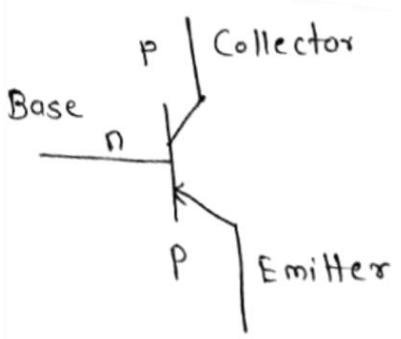


Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 14/22

$= \frac{230}{115} = \frac{N_2}{36}$ $N_2 = \frac{230}{115} \times 36$ <p>No of turns of HV side $N_2 = 72$ -----1mark</p>		1
B) Attempt any one:		6
a) Draw symbols of PNP and NPN transistor. What is difference between PNP and NPN any two? How transistor worked as amplifier?		6
<p>Answer: (Symbol -2 marks, Difference-2marks,working- 2marks)</p> <p>Symbols of PNP and NPN transistor</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>(a) NPN.</p> </div> <div style="text-align: center;">  <p>(b) PNP.</p> </div> </div>		2
Sr.	NPN Transistor	PNP Transistor
1	The npn transistor consists of P type semiconductor fused to N type semiconductor on opposite sides	The npn transistor consists of N type semiconductor fused to P type semiconductor on opposite sides
2	Concentration of electrons is more in npn transistor	Concentration of holes is more in pnp transistor
<p>A transistor raises the strength of a weak signal and thus acts as an amplifier figure shows the basic circuit of a transistor amplifier. The weak single is applied between emitter –base junction and output is taken across the load RC connected in the collector circuit. V_{EE} is applied in the input circuit in addition to the signal as shown.</p> <p>As the input circuit has low resistance, therefore a small change in signal voltage causes an appreciable change in emitter current. This causes almost the same change in collector current due voltage across it. Thus a weak signal applied in the input circuit appears in the amplified form in the collector circuit. It is this way that a transistor acts as an amplifier.</p>		2

Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 15/22

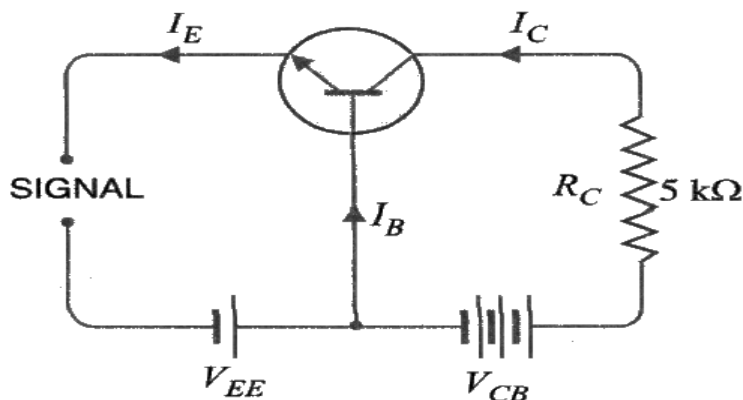


Fig: Transistor as an Amplifier

b) What is meant by demultiplexer? Explain its working with neat block diagram also draw schematic diagram.

6

Answer: (Definition-1 mark, Block diagram-1mark, Working-2 marks, Logical diagram- 2marks)

Demultiplexer:

A demultiplexer (DEMUX) basically reverse the multiplexing function. It takes digital input and routes it to one of the many output depending on status of select lines.

1

Working: The figure shows a 1 to 4 line demultiplexer (DEMUX) circuit. The data input line goes to all to the AND gates. The two data select lines enable only one gate at a time and the data appearing on the data input line will pass through the selected gate to the associated data output line.

		Inputs		Outputs				
E	D _{in}	S ₁	S ₀	Y ₀	Y ₁	Y ₂	Y ₃	
1	0	0	0	0	0	0	0	Y ₀ is connected to D _{in}
1	1	0	0	1	0	0	0	
1	0	0	1	0	0	0	0	Y ₁ is connected to D _{in}
1	1	0	1	0	1	0	0	
1	0	1	0	0	0	0	0	Y ₂ is connected to D _{in}
1	1	1	0	0	0	1	0	
1	0	1	1	0	0	0	0	Y ₃ is connected to D _{in}
1	1	1	1	0	0	0	1	

Fig: Truth table

2

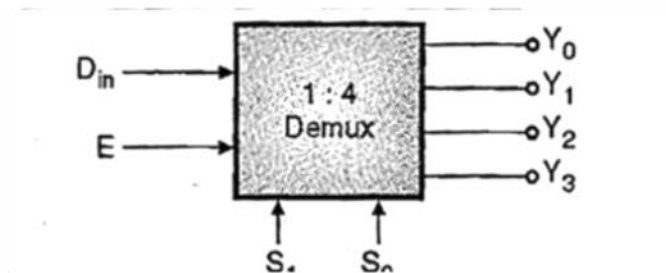


Fig block diagram of demultiplexer (1:4)

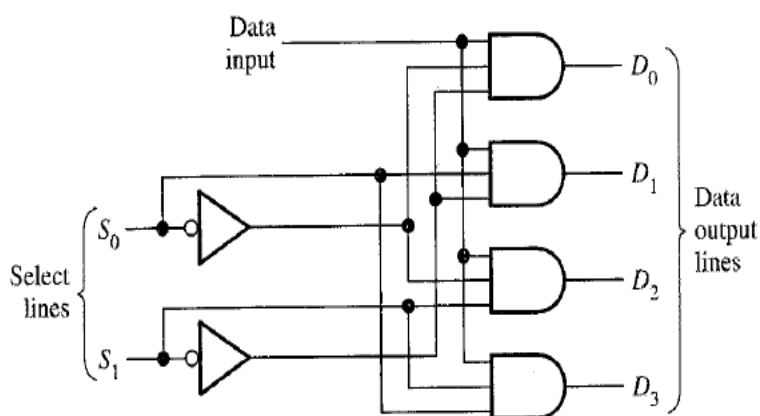


Fig Logical diagram

5. Attempt any four :

a) Explain working principle of piezo – electric transducer

Answer: (Working 2Marks and Diagram 2 Marks)

Working principle of piezoelectric transducer: Piezoelectric effect: Certain materials when mechanically strained generate within themselves an electric charge. This effect is called as piezoelectric effect. This effect is also reversible. This means that if a charge is applied, the material deforms mechanically. Such materials when subjected to alternating electric field will expand and contract alternatively. Consider the above figure where a piezo crystal is sandwiched between two metal electrodes, if pressure or force is applied on the crystal then, the material deforms mechanically and generates electrical output which is proportional to applied force or pressure.

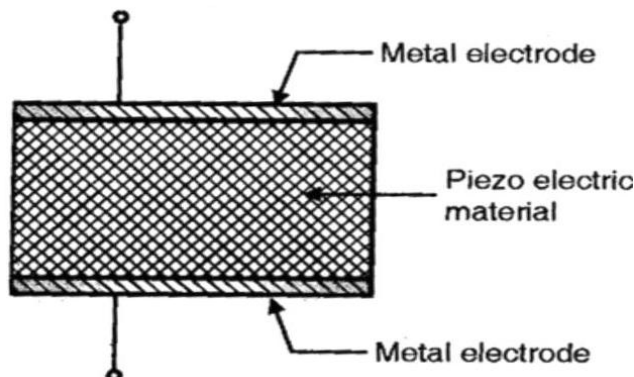


Fig : Piezo – electric transducer

b) Why single phase motor is not self-starting? How can it be started?

4

Answer: (Reason- 3 marks, Mechanism-1mark)

Single phase induction motor:

Single phase induction motor is more or less similar to a polyphase induction motor except that its stator is provided with single phase winding and a centrifugal switch is used in some types of motors in order to cut out a winding used only for starting purposes. It has distributed stator winding and a squirrel cage rotor. When fed from a single phase supply. Its stator winding produces a flux or field which is only alternating i.e. one which alternates along one space axis only. It is not a synchronously revolving or rotating flux, as in the case of a two or a three phase stator winding fed from a 2-or 3-phase supply. Now an alternating or pulsating flux action on a stationary squirrel cage rotor cannot produce rotation (only a revolving flux can). That is why a single phase motor is not self-starting.

3

However of the rotor of such a machine is give an initial start by hand or small motor or otherwise in either direction then immediately a torque arises and the motor accelerates to its final speed (unless the applied torque is too high).



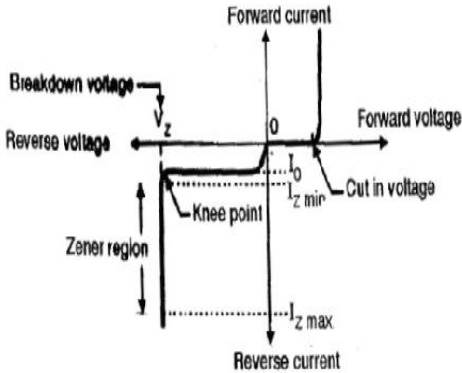
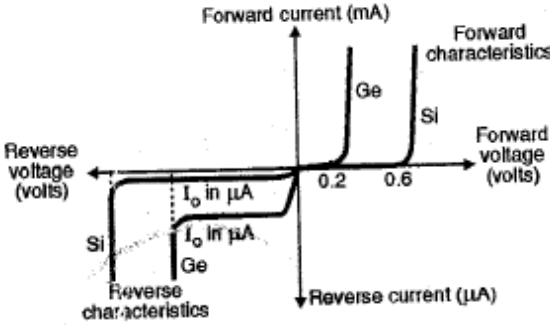
1

c) Compare Zener diode and P-N junction diode with following point:

- 1) Construction
- 2) symbols
- 3) Characteristics
- 4) applications

4

Answer: Comparison of Zener diode and P-N junction diode:

Point	Zener diode	P-N junction diode
Construction	Doping of zener diode is adjusted to operate in reverse biased condition	Doping of p-n diode is adjusted to operate in forward biased condition
Symbols		
Applications	Applications are in rectifiers, clippers, clampers vtg multipliers.	Applications are in vtg regulators Vtg limiters etc
Characteristics		

4

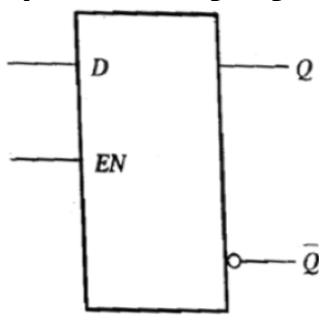


Winter – 15 EXAMINATION

Subject Code: **17524**

Model Answer

Page No: 18/22

d) Give constructional difference between thermistor and RTD any two points.					4																							
Answer: Constructional difference between thermistor and RTD: (Any two -each carry 2marks)					4																							
Sr. No	Thermistor		RTD																									
1	They are made of metallic oxide of Cu, Ni, Fe.		They are made of metals like Cu, Pt, Ni.																									
2	They are available in both types that is positive and negative temperature coefficient.		They are available in positive temperature coefficient of resistance.																									
3	Different shapes like bead, disc ,rod washer are available.		No such shapes are available																									
e) What is principle of stroboscope? Draw symbol of D flip flop and give its truth table.					4																							
Answer : (Principle- 2marks, symbol-1mark, Truth table-1mark)					2																							
Principle of stroboscope: The stroboscope is a simple portable manually operated device which may be used for measurement of periodic or rotary motions. Basically the instrument is a source of variable frequency flashing brilliant light, the flashing frequency being set by the operator. The circuit used is based upon variable frequency oscillator which controls the flashing frequency. The speed is measured by adjusting the frequency so that the moving objects are visible only at specific intervals time.																												
<div>Symbol of D flip flop</div> 																												
<div>Truth table:</div> <table><tr><th colspan="2">Inputs</th><th colspan="2">Outputs</th><th rowspan="2">Comments</th></tr><tr><th>D</th><th>EN</th><th>Q</th><th>\bar{Q}</th></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>RESET</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>SET</td></tr><tr><td>X</td><td>0</td><td>Q_0</td><td>\bar{Q}_0</td><td>No Change</td></tr></table>						Inputs		Outputs		Comments	D	EN	Q	\bar{Q}	0	1	0	1	RESET	1	1	1	0	SET	X	0	Q_0	\bar{Q}_0
Inputs		Outputs		Comments																								
D	EN	Q	\bar{Q}																									
0	1	0	1	RESET																								
1	1	1	0	SET																								
X	0	Q_0	\bar{Q}_0	No Change																								
6. Attempt any four :					16																							
a) Explain working principle of stepper motor.					4																							
Answer: (Diagram- 2marks, Working- 2marks)																												
Stepper motor: A stepper motor is an electrical motor which converts electrical inputs in the form of series of pulses into discrete angular movements commonly called as steps. This conversion is on one to one basis i.e. the motor moves through one step for each input pulse.																												

Winter – 15 EXAMINATION

Subject Code: 17524

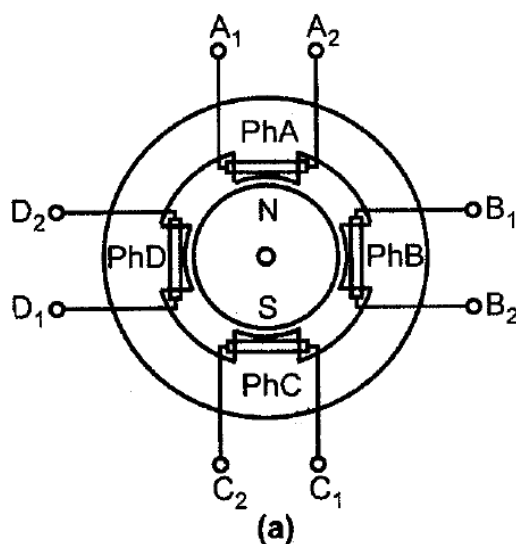
Model Answer

Page No: 19/22

1. Variable reluctance motors: In this type motor, both stator and rotor has a toothed structure with the same tooth pitch. The stators of the three stacks have a common frame while the rotors have a common shaft. The teeth of all the rotors are perfectly aligned with respect to each other while the stator teeth of various stacks are arranged to have a progressive angular displacement of -

$$\beta = \frac{360^\circ}{q \cdot T}$$

Where q = number of stacks
T = Number of teeth



OR

2. Permanent magnet stepper motor:

If the phases are excited in sequence A-B-C-D due to electromagnetic torque developed by the interaction between the magnetic field set up by the exciting winding and the permanent magnet the rotor will be driven in clockwise direction as shown in figure in this case the step angle will be obviously 90° .

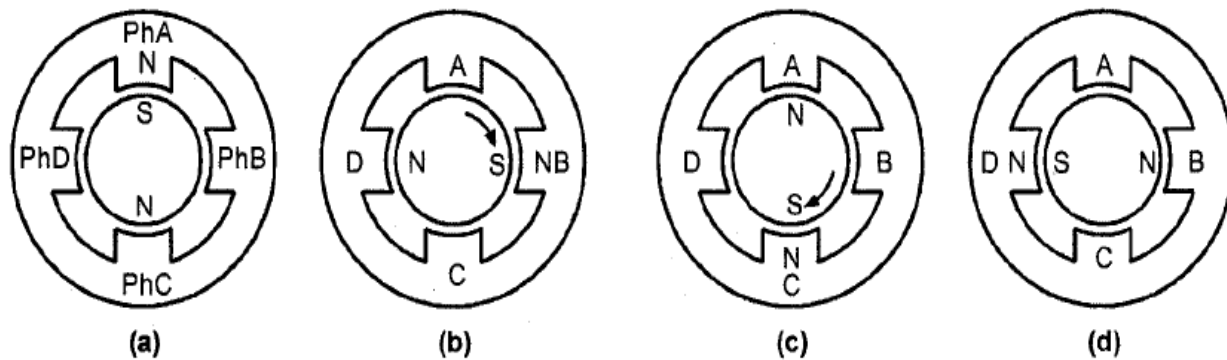


Fig: Permanent magnet stepper motor



Winter – 15 EXAMINATION

Subject Code: 17524

Model Answer

Page No: 20/22

b) With neat diagram explaining working of shift register.

4

Answer: (Diagram- 2marks, Working-2marks)

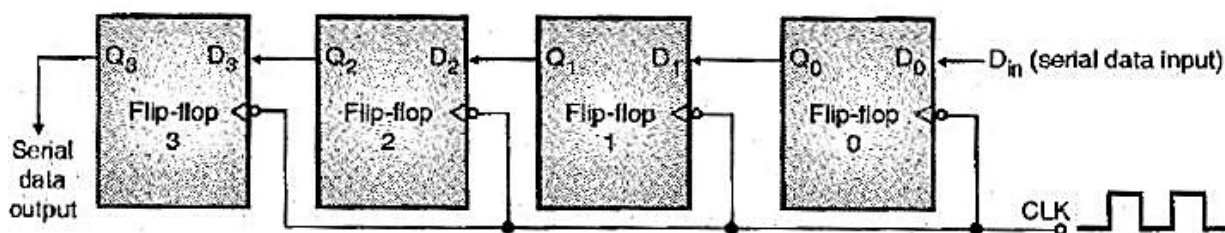
Shift Register: A shift register is a group of memory element connected together to form a memory unit.

Modes of operation of a shift register

1. Serial input serial output(serial shift right/left)
2. Serial input parallel output
- 3.Parallel input parallel output
- 4.Parallel input serial output

(Equivalent credit should be given to any one mode of operation)

1. Serial input serial output(serial shift right/left):



2

The D input of FF-0 i.e D_0 is connected to serial data input (D_{in}). Output of FF-0 i.e Q_0 is connected to the input of the next flip flop D_1 and so on.

Before application of clock signal let $Q_3 Q_2 Q_1 Q_0 = 0000$ and apply MSB bit of number to be entered to D_{in} . So $D_{in} = D_0 = 1$. On first falling edge of clock FF-0 is set & stored word in the register is $Q_3 Q_2 Q_1 Q_0 = 0001$. Applying the next bit to D_{in} . So $D_{in} = 1$. As soon as the next negative edge of clock FF-1 is set & stored word in the register is $Q_3 Q_2 Q_1 Q_0 = 0011$. Apply the next bit to D_{in} . So $D_{in} = 1$. As soon as the next negative edge of clock FF-2 is set & stored word in the register is $Q_3 Q_2 Q_1 Q_0 = 0111$. Similarly $D_{in} = 1$ and with the next negative edge of clock FF-3 is set & stored word in the register is $Q_3 Q_2 Q_1 Q_0 = 1111$.

2

c) What is the necessity of filter and give different types of filter?

4

Answer: (Necessity - 2marks, types - 2marks)

Necessity of filter: A filter circuit is a device which removes the a.c. component of rectifier output but allows the d.c. components to reach the load.

Generally a rectifier is required to produce pure d.c. supply for using at various places in the electronic circuits. However the output of a rectifier has pulsating character i.e. it contains a. c. and d.c. components. The a. c. component is undesirable and must be kept away from the load. To do so a filter circuit is used which removes or filter out the a.c. component and allows only the d.c. components to reach the load.

2

Types of filter:

1. Capacitor filter
2. Choke input filter
3. CLC filter or Π filter
4. LC filter

2



Winter – 15 EXAMINATION

Subject Code: **17524**

Model Answer

Page No: 21/22

d) A sinusoidal waveform is represented by $V = 41.44 \sin \left(2\pi \omega t + \frac{\pi}{2} \right)$	4
<p>Answer: Credit should be given correct formulas & correct procedure.</p> <p>Given: $V = 41.44 \sin \left(2\pi \omega t + \frac{\pi}{2} \right)$</p> <p>To find- ?</p> <ol style="list-style-type: none"> 1. V_m 2. f 3. t 4. ω <p>Solution: Assuming given equation to be</p> $V = 41.44 \sin \left(2\pi \omega t + \frac{\pi}{2} \right)$ <p>Comparing with equation</p> $V = V_m \sin(\omega t + \phi)$ <p>1) Amplitude = $V_m = 41.44$ volts</p> <p>2) Angular velocity = $\omega = 2\pi$ rad/sec</p> <p>3) Frequency (f)</p> $\omega = 2\pi f$ <p>But we have, $\omega = 2\pi$</p> <p>Therefore $f = 1$ hertz</p> $t = \frac{1}{f}$ <p>Therefore $t = 1$ sec</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
e) Draw a neat labeled diagram of RTD and state its operating principles.	4
<p>Answer: (Diagram- 2marks, operation- 2marks)</p> <p>Resistance thermometer:</p> <p>The resistance of a conductor changes when its temperature is changed. The resistance thermometer or RTD is an instrument used to measure electrical resistance in terms of temperature. The relationship between resistance and temperature is given by :</p> $R_t = R_0(1 + \alpha \Delta t)$ <p>Where,</p> <p>R_t - resistance at t temperature</p> <p>R_0 - resistance at zero temperature</p> <p>α - temperature co-efficient</p> <p>Δt - temperature difference</p>	2



Subject Code: 17524

Winter – 15 EXAMINATION
Model Answer

Page No: 22/22

