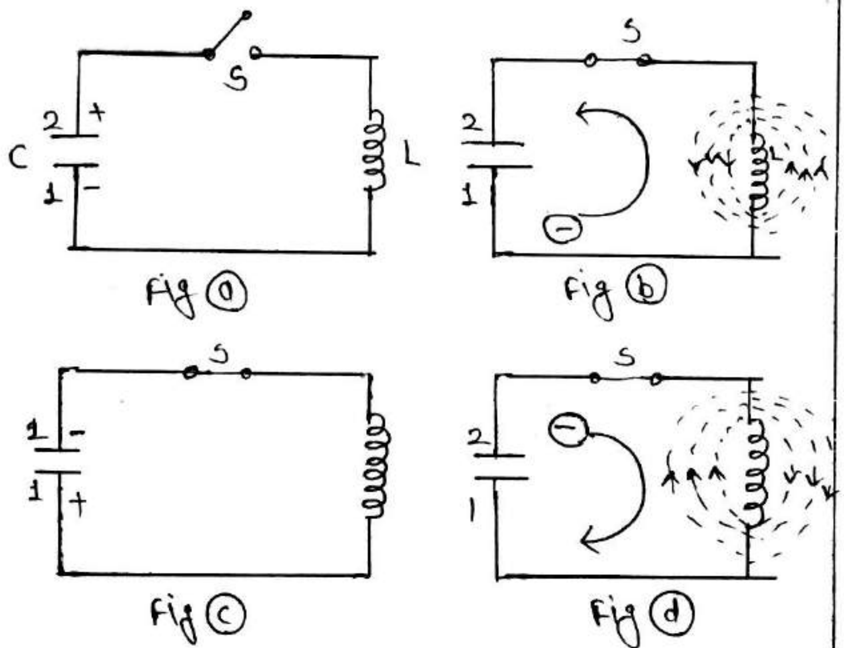
GOVERNMENT POLYTECHNIC , PUNE

MODEL ANSWERS AND MARKING SCHEME(ODD 2019)

COURSE NAME: ELEMENTS OF ELECTRONICS ENGINEERING

COURSE CODE: ET2105

SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.1	a) Ans:	Explain concept of oscillations on LC Tank circuit.  A circuit which produces electrical oscillation of any desired frequency is known as an oscillatory circuit. This circuit consist of two reactive elements namely inductor L and capacitor C connected in parallel with each other as shown in fig (a) Thus such a circuit is also known as LC Tank circuit. An inductor stores energy in it's magnetic field whenever current flows through it	Correct figure 2 Marks valid Description 2 Marks

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Q. 1	a) Ans:	similarly capacitor stores energy in it's electric field, whenever a voltage is applied across it's plates. suppose capacitor has been charged from a dc voltage source with polarity as shown in Fig (a) as the switch S is open it cannot discharge through the coil(L) When switch is closed as shown in Fig (b) the capacitor discharge through the coil L. The discharging due to the flow of electrons from plate 1 to 2 through coil (L) indicated by the arrow. This current flow sets up magnetic field around the coil. This magnetic field stores the energy released by the electric field. At this instant the electrical energy stored in the capacitor becomes zero and the energy stored in magnetic field is max^m. once the capacitor is discharged completely the magnetic field around the coil begins to collapse and produces a counter emf According to Lenz's law the counter emf keeps the electrons moving in the same dir^n as shown in fig (b) This again charges the capacitor though in the opposite direction as show in fig (c) when the capacitor is charged completly in the opposite direction the magnetic	

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Q.1	4)	field around the coil is also collapsed completely. At this instant the energy previously stored in the magnetic field has now converted into the energy stored in the electric field of capacitor. After this capacitor starts discharging in the opposite direction so that electrons now move from plate 2 to 1 as shown in fig (d) The electric field start collapsing whereas magnetic field starts building up again but in Reverse direction the above mentioned sequence of charging and discharging of a capacitor result in an alternate motion of electrons. As a result of this, energy is alternatively stored in the electric field of the capacitor and magnetic field of the coil. This interchange of energy between capacitor and coil continues to be repeated and results in the production of electrical oscillations.	

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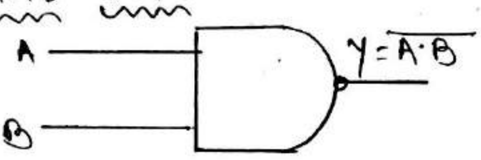
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.1	b)	Draw symbols and truth table of NAND Gate, NOR, AND, OR Gate.	
	Ans:	i) NAND Gate →	For each correct symbol and truth table 1M

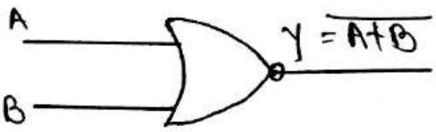


NANA Gate symbol

Truth Table

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

ii) NOR Gate →

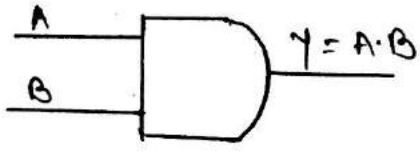


symbol of NOR Gate

Truth Table

Input		O/P
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

iii) AND Gate →



Truth Table →

Input		O/P
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

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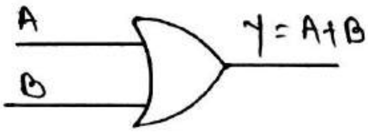
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME

Q.1 b) iv) OR Gate →



symbol of OR Gate

Input A	Input B	o/p Y
0	0	0
0	1	1
1	0	1
1	1	1

Q.1 c) State any Four Basic laws of Boolean Algebra.

Ans: i) Commutative law →

a) $A + B = B + A$

b) $A \cdot B = B \cdot A$

ii) Associative law →

a) $(A+B)+C = A+(B+C)$

b) $(A \cdot B) \cdot C = A \cdot (B \cdot C)$

iii) Distributive law ⇒

a) $A(B+C) = AB+AC$

Marking scheme: each correct law 1 Mark.

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.1	c)	iv) AND law → a) $A \cdot 0 = 0$ b) $A \cdot 1 = A$ c) $A \cdot A = A$ d) $A \cdot \bar{A} = 0$ v) OR law → a) $A + 0 = A$ b) $A + 1 = 1$ c) $A + A = A$ d) $A + \bar{A} = 1$ vi) Inversion law a) $\bar{\bar{A}} = A$.	

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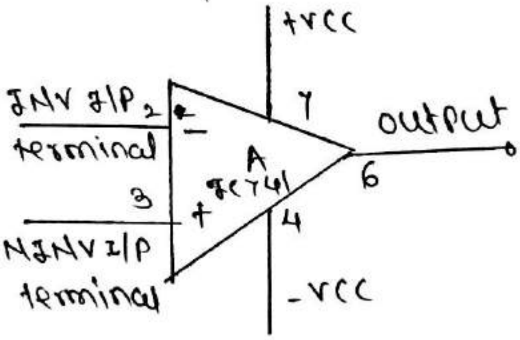
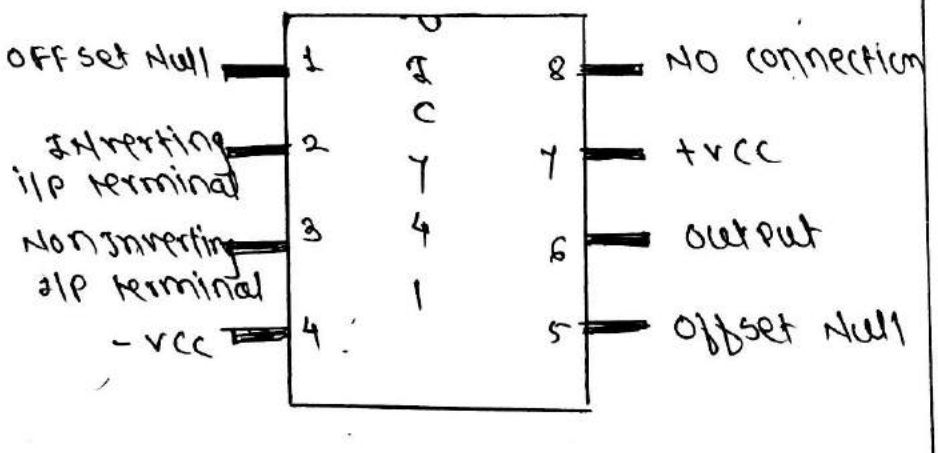
<table>
<tr><th>SR.NO</th><th>SUB QUE.</th><th>MODEL ANSWERS</th><th>MARKING SCHEME</th></tr>
<tr><td>Q.1</td><td>d)

Ans:</td><td>Draw symbols and pin diagram of IC741



symbol of OP-AMP



PIN Diagram of IC 741</td><td>for correct symbol 2 Marks

For correct pin diag. 2 Marks</td></tr>
</table>

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MODEL ANSWERS AND MARKING SCHEME(ODD 2019)

COURSE NAME: ELEMENTS OF ELECTRONICS ENGINEERING

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.1	e)	State specifications of CRO and Function generator (each Two)	For correct specification of each 2 Marks
	Ans.	Specifications of CRO → a) The vertical sensitivity → It is ratio of voltage applied to vertical deflection plates to the deflection in cm. It is measured as volts/div. b) Input impedance → This is the impedance offered by the CRO to the given i/p signal. Typical values of these parameter are 1MΩ shunted by 25 pF. c) Maximum i/p → This is the max^m value of voltage that can be applied to the given CRO safely. Typical value of max^m i/p voltage = 400Vdc d) Accuracy → The accuracy is expressed in terms of percentage. Typical value of CRO is ± 3%. e) Bandwidth → This is 3dB Bandwidth of vertical ampl^r of CRO. Typical value is 15MHz.	

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.1	e)	specification of Function generator → 1) make/ model 2) power supply - 230V AC, 50Hz 3) calibration accuracy - ±1% under normal conditions 4) Display type - Analog/ digital $3\frac{1}{2}$ - $3\frac{3}{4}$ 5) Freq. Range 6) Frequency Response - within ±1dB (1kHz ref) over entire freq. range 7) Freq. shift - ±15% variation in the volt should not affect freq. o/p 8) signal generation - sine /square/ sawtooth / triangular etc.	
Q.1	f)	state classification of Transducer with one example of each.	For valid classification 4M.
	Ans:	on the basis of method of transduction A) Active Transducer → These are the transducer which do not require any external or auxillary power source to generate equivalent output i.e volt or current. They are self generating	

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.1	b)	transducers eg. Piezoelectric crystal transducer B) passive transducers → These are the transducers that require external or auxillary power supply for their operation of conversion of physical quantity into electrical signal eg. measurement of displacement using LVDT and potentiometer. c) Analog Transducers → They convert the input physical quantity into analog output which is contineous function of time eg. thermocouple. d) Digital transducer → They convert the input physical quantity into digital form. i.e in the form of pulses having logic 0 & logic 1 eg. Rotory Encoder. E) primary and secondary transducer → sometimes physical quantity is not suitable for direct transduction. eg. pressure measurement using LVDT Here first pressure is converted into linear displacement	

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.7	f)	by using Bourdon Tube and then linear displacement is converted into voltage using LVDT. Here the bourdon tube acts as a primary Transducer because it senses pressure and converts it into displacement. which is suitable for LVDT which acts as secondary Transducer. a) on the Basis of Electrical parameters A) Resistive Transducers → In these transducer resistance of sensing element changes in accordance with the physical quantity to be measured. eg. i) Potentiometer ii) strain guage B) capacitive Transducer → These Transducers are used for the measurement of rotational motions with change in capacitance. This change in capacitance gets converted into an equivalent electrical signals eg. They are used for meas. of displacement vibrations, pressure, sound, level etc. c) Inductive transducers → They convert the displacement into change in inductance It works on following principle. i) change in self inductance ii) change in mutual inductance.	

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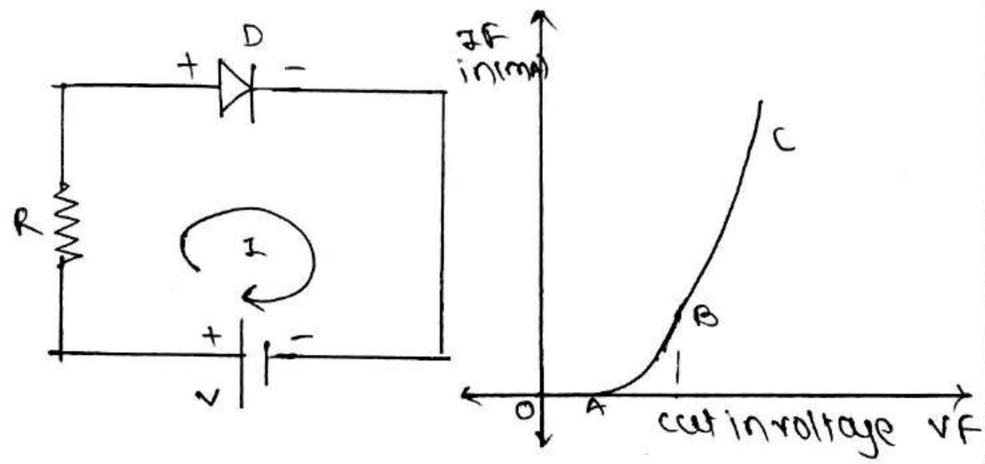
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.2	a)	Draw the forward and Reverse characteristics of PN junction diode and explain it.	
	Ans:	 Fig. (a) Constructional diagram Fig (b) Forward chs. Fig (a) shows the constructional diagram of PN junction diode in forward biased and Fig (b) shows forward chs of PN junction diode. When positive terminal of battery is connected to P type semiconductor and negative terminal of battery is connected to N type semiconductor then the diode is said to be in forward biased. Due to Negative terminal of battery connected to N region free electrons from N side are pushed towards P side	For diagram For [illegible] 3Marks For valid description 3M.

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.2	a)	similarly positive end of battery is connected to P region free holes from P region are pushed towards N side. with increase in battery supply voltage V more and more number of holes from P side & electrons from N side start travelling towards the junction. A large No. of minority carriers crossing the junction constitute a current called Forward current. Due to forward biasing the width of depletion region decreases and thus the potential barrier also decreases. as long as voltage V is less than potential barrier, the Forward current does not flow but once the external voltage become equal to the Barrier voltage (cut in voltage), the diode starts conducting and current increases as external voltage increases. Fig (b) shows the forward characteristics of PN junction diode. The relation between Forward current and Forward voltage is known as forward chs. of diode. The forward characteristics of diode is divided into two parts i) Region AB → Here in this region the forward voltage is small and less than cut in voltage	

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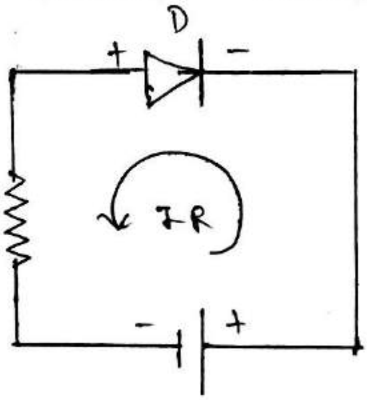
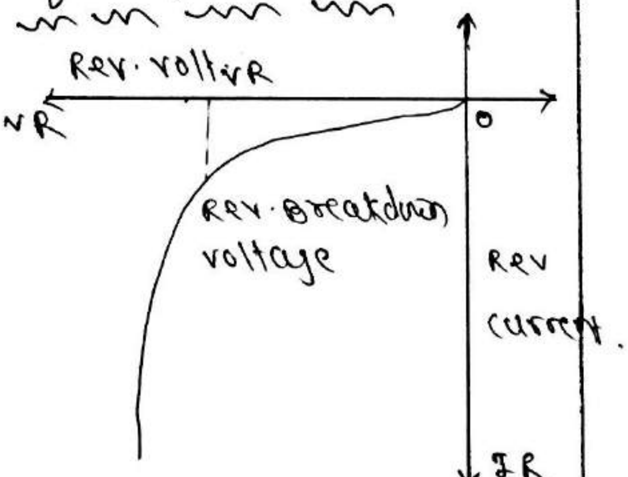
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.2	a)	and width of depletion region goes on decreasing 2) Region B to C → In this region B to C as soon as the forward voltage is equal to the cut in voltage of diode the current in the diode increases rapidly as shown in fig (b). cut in volt for si = 0.7v and for Ge = 0.3v. Reverse Biasing of PN junctn diode →  Fig (c) Reverse Biasing of PN junction diode  Fig (d) Reverse chs of PN junctn diode	

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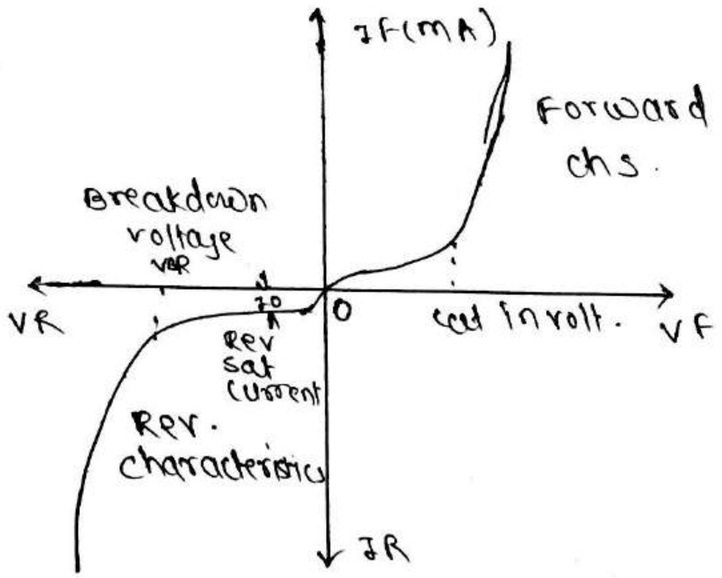
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.2	a)	 Fig (e) VI chs of PN junct^n diode Fig (c) shows the constructional diagram of PN junction diode in Reverse biased. Fig (d) shows the Reverse bias characteristics of PN junction diode. If the P region of diode is connected to Negative terminal of battery and N region is connected to +ve terminal of battery then the diode is said to be in Reverse biased. The Reverse current is denoted by IR & flows from cathode to anode. when the diode is in Reverse bias, holes in P region are attracted towards Negative terminal of supply and electrons	

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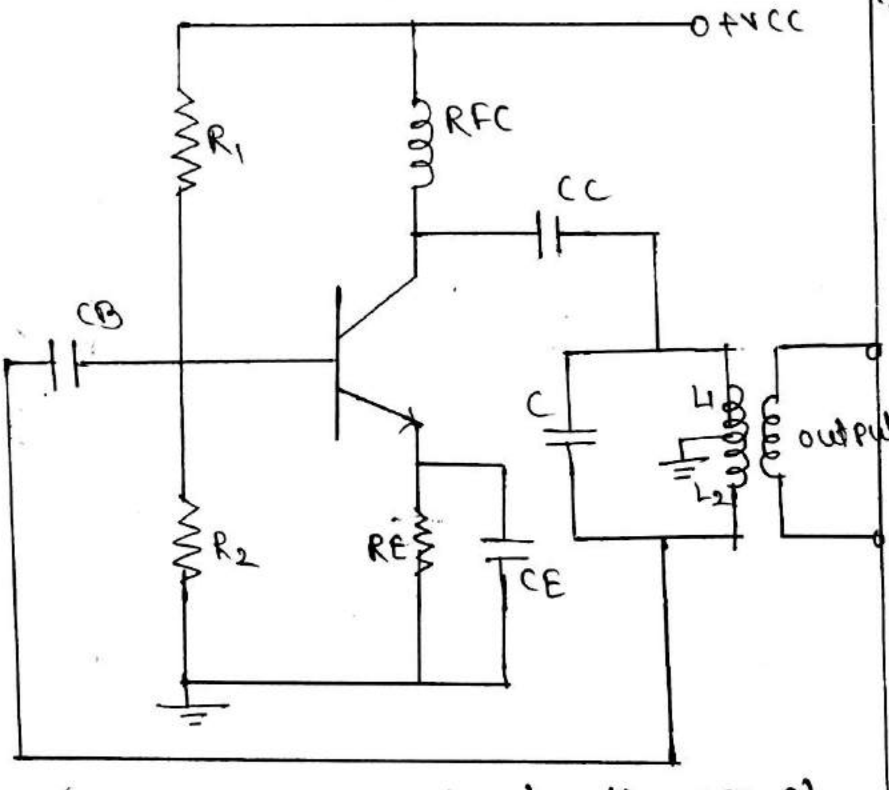
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.2	b)	Draw the circuit and explain working principle of Hartley oscillator. state it's formula for frequency of oscillations.	For correct diagram 3 Marks
	Ans:		
		Fig (a) circuit diagram of Hartley oscillator	For valid explaination 2 M
		Fig. (a) shows the circuit of a Hartley oscillator. It consist of tank circuit of two coils L_1 and L_2 the coil L_1 is inductively	

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.2	b)	coupled to coil L_2 and the combination works as an autotransformer. A coil called Radio frequency choke (RFC) is connected between collector and Vcc supply. It acts as a Load for the collector and also permits an easy flow of dc current but blocks ac current. The feedback between the output and input circuits is accomplished through autotransformer action which also introduces a phase shift of 180°. The transistor also introduces a phase shift of 180° therefore total phase shift is 360° and hence the feedback is positive. The capacitor CC connected between collector and Tuned circuit is called coupling capacitor. it permits only the ac currents to pass to the tank circuit. The capacitor CB called blocking capacitor, further blocks the dc currents reaching the base. The resistors R_1, R_2, and RE are used to provide dc bias to the transistor. When the circuit is energised by switching on the supply collector current flows	

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.2	b)	coupled to coil L_2 and the combination works as an autotransformer. A coil called Radio frequency choke (RFC) is connected between collector and Vcc supply. It acts as load for the collector and also permits an easy flow of dc current but blocks ac current. The feedback between the output and input circuits is accomplished through autotransformer action which also introduces a phase shift of 180°. The transistor also introduces a phase shift of 180° therefore total phase shift is 360° and hence the feedback is positive. The capacitor CC connected between collector and tuned circuit is called coupling capacitor. it permits only the ac currents to pass to the tank circuit. The capacitor CB called blocking capacitor, further blocks the dc currents reaching the base. The resistors R_1, R_2, and RE are used to provide dc bias to the transistor. When the circuit is energised by switching on the supply collector current flows	

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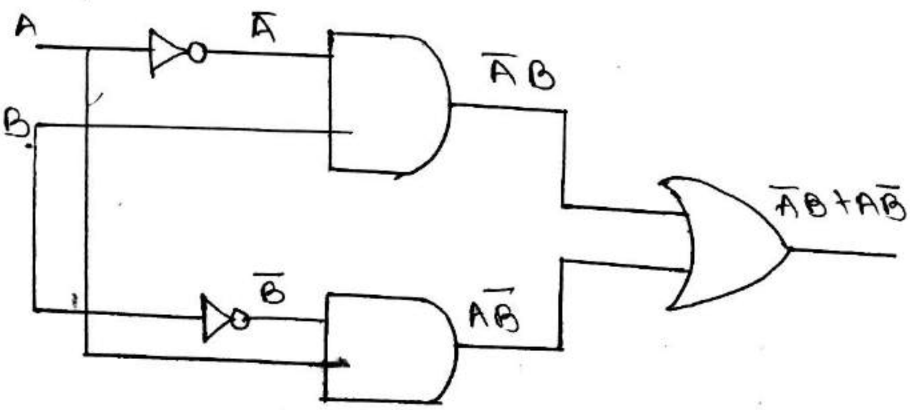
Q.2	b)	The oscillations are produced because of positive feedback from the tank circuit. The frequency of oscillations is given by $f_0 = \frac{1}{2\pi\sqrt{LC}}$ where $L = L_1 + L_2 + 2M$ $L = L_1 + L_2$ (If the mutual inductance M is neglected)	For correct freq. formula 1 Mark
Q.1	c) Ans:	Implement a digital circuit for logic equation using suitable gates. i) $Y = \bar{A}B + A\bar{B}$ 	For correct implement each 3M.

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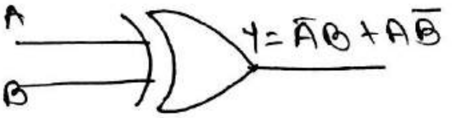
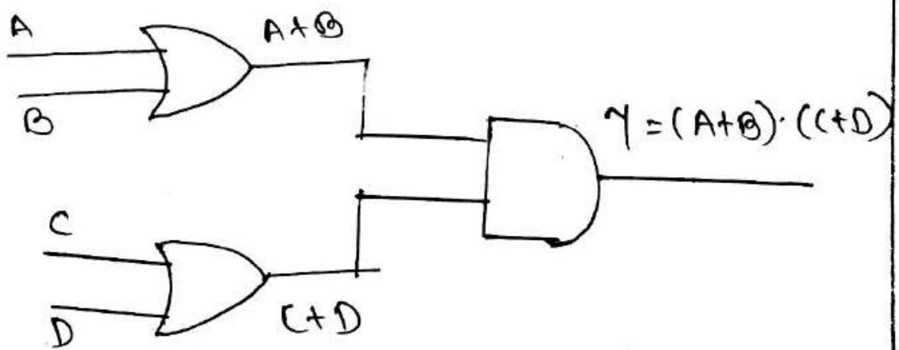
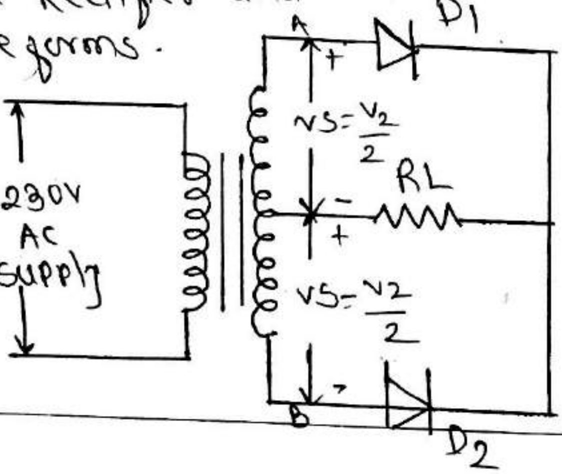
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.2	c)	i) OR  ii) $Y=(A+B)\cdot(C+D)$ 	
Q.3	a) Ans:	Draw the circuit diagram of center tap full wave Rectifier and explain it with it's wave forms.  Fig (a) circuit diagram of centre tap FWR	For correct circuit diagram 2 Marks

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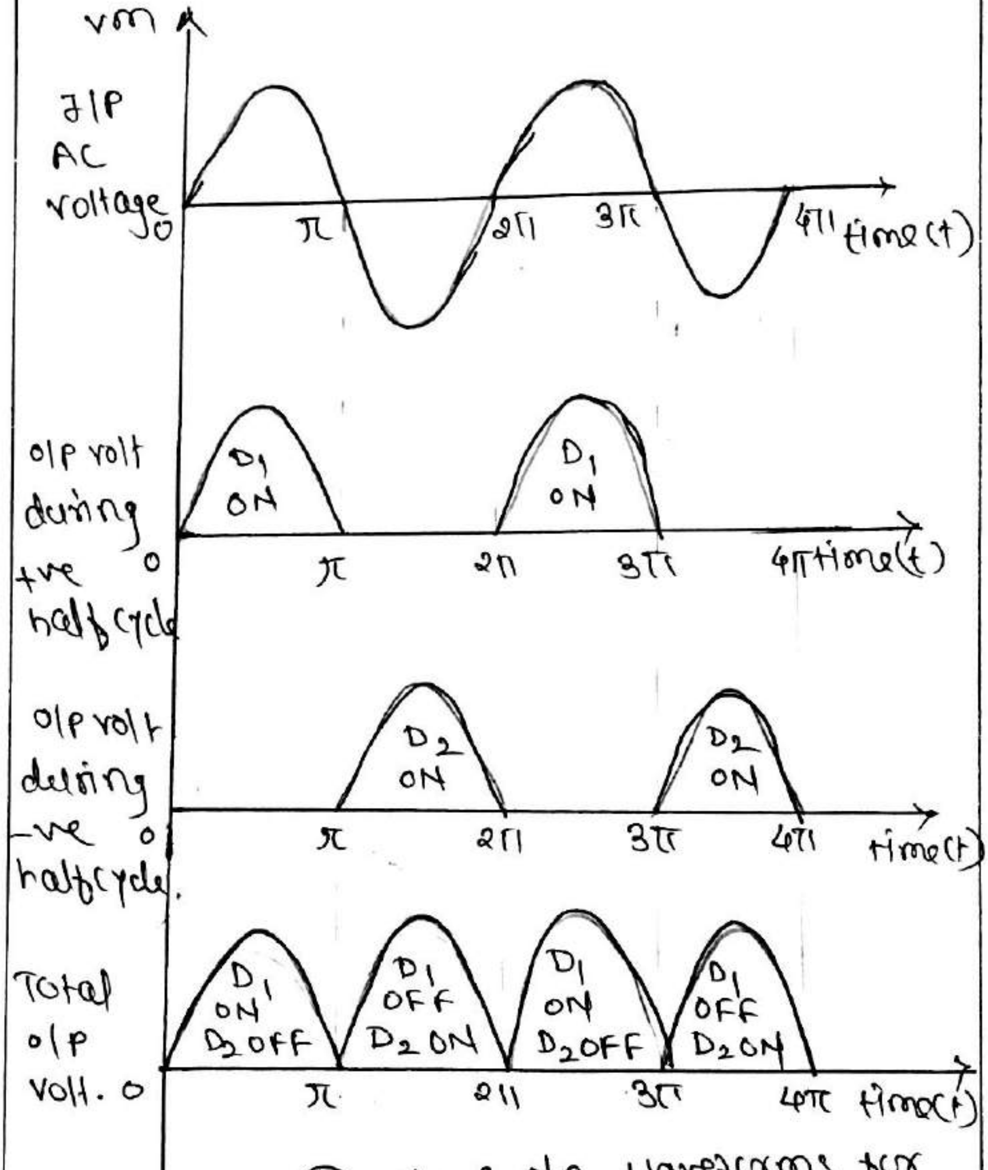
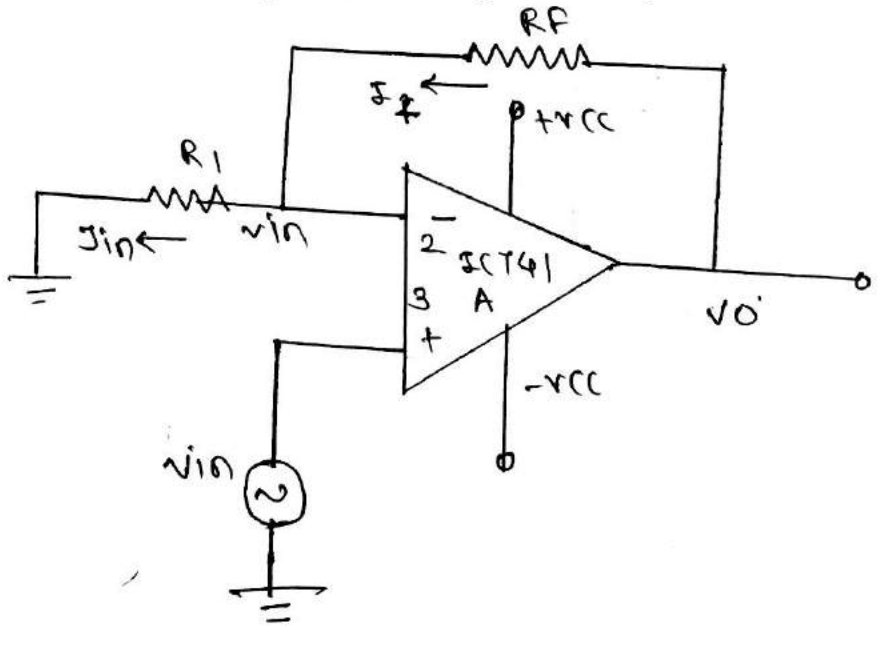
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q. 3	a)	 fig. (6) I/P & O/P waveforms for centre tapped FWR	For correct waveforms 2 Marks

SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.8	a)	Fig. (a) shows the circuit diagram of centre tap full wave rectifier. The circuit uses two diodes which are connected to the centre tapped secondary winding of transformer. The input signal is applied to the primary winding of the transformer. The centre tap on the secondary winding of a transformer is usually taken as the ground or zero voltage. The voltage across secondary winding (vs) is divided into two parts. i.e. $\frac{vs}{2}$ and $\frac{vs}{2}$ During the positive half cycle when A is positive and terminal B is negative diode D_1 becomes forward biased and diode D_2 becomes reverse biased. As a result of this diode D_1 conducts and D_2 is OFF. so we will get o/p same as i/p During the negative half cycle of i/p AC voltage when point A is negative and B is positive diode D_2 is forward biase and diode D_1 become reverse biased as a result of this diode D_1 is OFF and diode D_2 is ON so current flows from diode D_2 load resistor to the sec. wdg.	For valid Explaination or working 2 Marks

SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
		of transformer. so we will full wave Rectified output during positive and Negative half cycle as shown in fig (b).	
Q. 3	b)	Draw the circuit diagram of OP-Amp as Non Inverting amplifier and also derive it's expression for gain of Amplifier.	For correct diagram 3 Marks
	Ans:	 Fig. circuit diagram of OP-Amp as Non Inverting amplifier.	

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.3	b)	By Kirchoff's current law. $I_F = I_{in}$ where $I_F = \frac{V_o - V_{in}}{R_F}$ and $I_{in} = \frac{V_{in} - 0}{R_1}$ $\therefore \frac{V_o - V_{in}}{R_F} = \frac{V_{in} - 0}{R_1}$ $\frac{V_o - V_{in}}{R_F} = \frac{V_{in}}{R_1}$ $R_1(V_o - V_{in}) = R_F V_{in}$ $R_1 V_o - R_1 V_{in} = R_F V_{in}$ $\therefore V_{in}(R_f + R_1) = V_o R_1$ $\therefore \frac{V_o}{V_{in}} = \frac{R_f + R_1}{R_1}$ $\therefore A_{CL} = 1 + \frac{R_f}{R_1}$	For expression derivation 3 Marks

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q. 3	c)	Draw the block diagram of function generator and explain function of each block.	
	Ans:	(see figure below)	For correct diagram 3 Marks

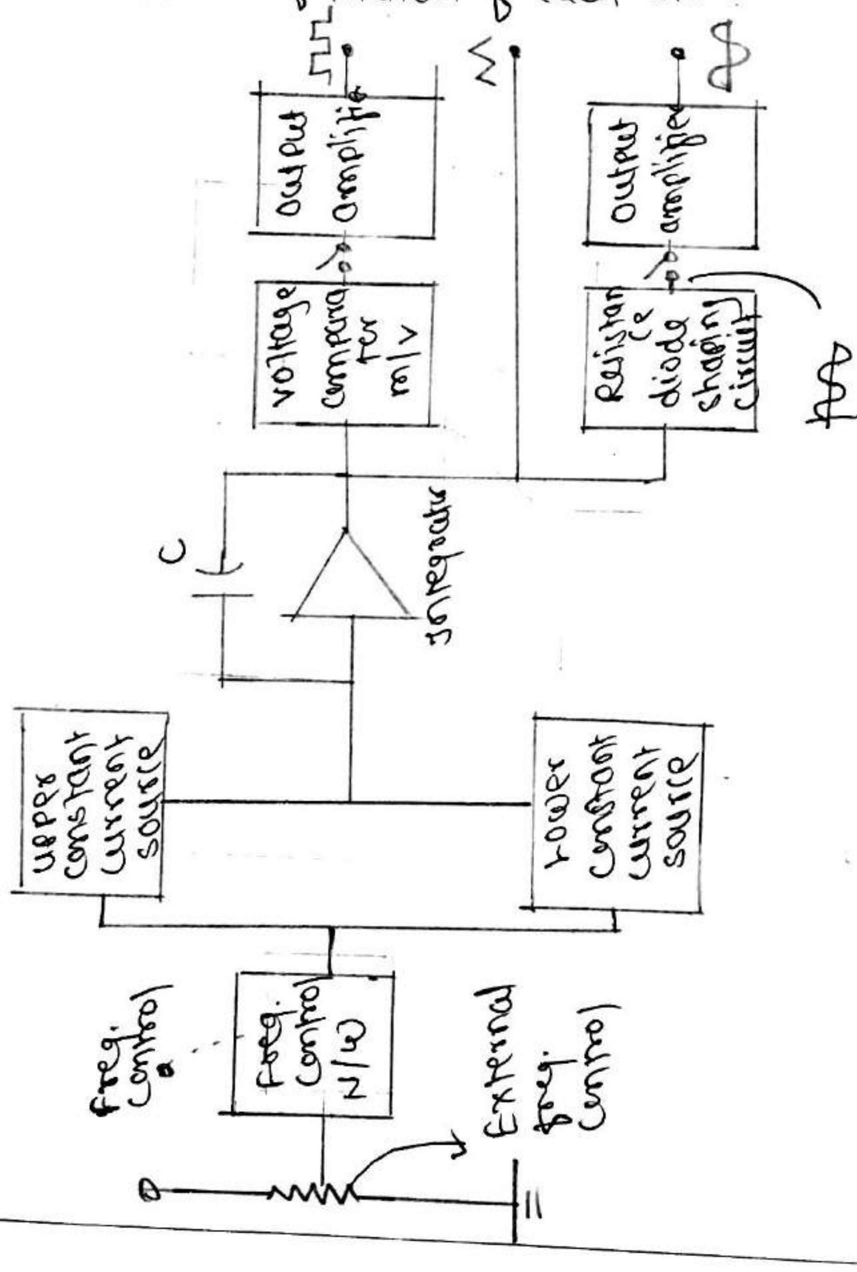

Fig @ Block diagram of Function generator

SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.3	c)	Fig. (a) shows the block diagram of function generator. A function generator produces different waveforms of adjustable frequency. The common output waveforms are sine wave, square, triangular and sawtooth waves. Usually the frequency is controlled by varying the capacitor in LC or RC circuit. In this instrument the frequency is controlled by varying the magnitude and of current which drives integrator. This instrument produces sine, triangular and square waves with frequency range of 0.01 Hz to 100 KHz. The frequency controlled voltage Regulates two current sources. The upper current source supplies constant current to the integrator whoes o/p voltage increases linearly with time, according to the equation of output signal voltage $e_{out} = \frac{-1}{C}\int_0^t i\,dt$.	For valid Explaination 3 Marks

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.3	c)	An increase or decrease in the current increases or decreases the slope of the output voltage and hence controls the frequency. The voltage comparator multivibrator changes state at a predetermined maximum level of the integrator output voltage. This change cuts off the upper current supply and switches on the lower current supply. The lower current source supplies a reverse current to the integrator, so that it's o/p decreases linearly with time. when the o/p reaches a predetermined minimum level the voltage comparator again change state and switches on the upper current source. The output of integrator is a triangular waveform whoes frequency is determined by the magnitude of the current supplied by the constant current sources. The comparator o/p delivers a square wave volt. of same frequency. The resistance diode network alters the slope of the triangular wave it's amplitude changes and produces a sine wave with less than 1% distortion.	

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MODEL ANSWERS AND MARKING SCHEME(ODD 2019)

COURSE NAME: ELEMENTS OF ELECTRONICS ENGINEERING

COURSE CODE: ET2105

SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
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MODEL ANSWERS AND MARKING SCHEME(ODD 2019)

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q 4	a) Ans:	Explain the following Terms. i) cut in voltage → A minimum voltage applied to a forward biased diode at which current starts increasing rapidly called as cut in voltage. for Si = 0.6 V, Ge = 0.3 V OR cut in voltage is also define as the voltage at which forward current starts increasing rapidly.	For each correct defn 2 marks

ii) Depletion Region →

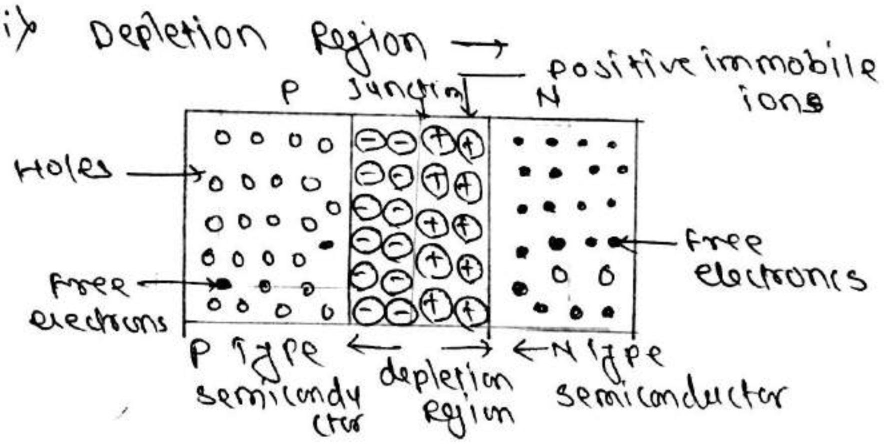

Fig (a) P-N Junction diode with depletion region.

At the instant of PN junction formation, the free electrons near the junction in the N region begin to diffuse across the

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.4	a)	junction into the p-region where they combine with holes near the junction. The result is that N region loses the free electrons as they diffuse into the junction. This creates a layer of positive charge (pentavalent ions) near the junction. As the electrons move across the junction, the p region loses holes as the electrons and holes combine. The result is that there is layer of Negative charges near the junction. These two layers of positive and negative charges form the depletion Region. depletion region contains only immobile ions and no free charge carriers. iii) Junction capacitance → Junction capacitance is the capacitance which forms in a PN junction diode under Reverse bias. When Reverse biased voltage applied across PN junction diode, the holes from P-type region moves away from junction	

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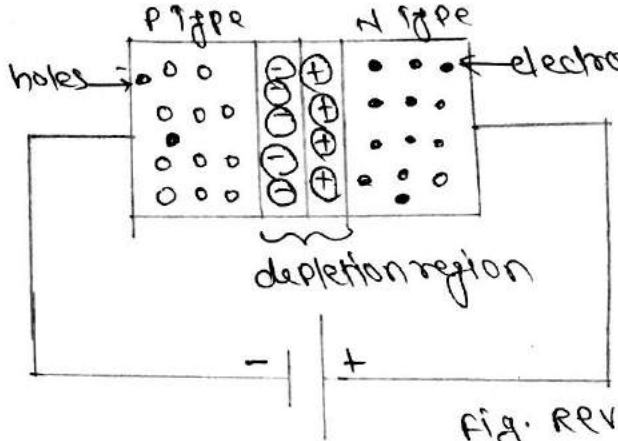
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.4	a)	Here the width of depletion region increases & it acts a dielectric medium and two electrodes store the electric charge.  Fig. Rev. bias PN junc When the voltage applied to PN junction increases the depletion region will increase. so the size of P & N region is decreased. consequently the ability to store electric charge will be reduced. The PN junction diode with more narrow depletion width & large junction can store more electric charge.	

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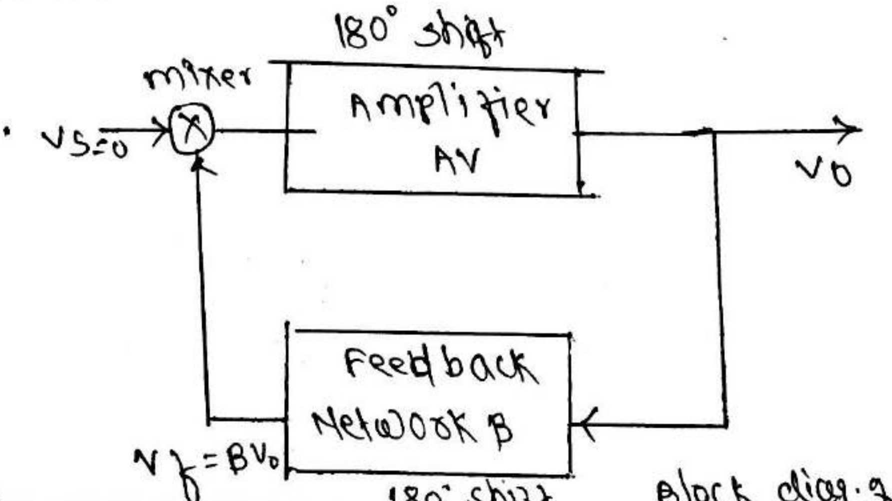
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.4	b)	Define oscillator. state and explain Barkhausen criteria for sustained oscillator.	For defination 2 Marks
	Ans:	oscillator is a device which produces an output signal, without any i/p signal of any desired frequency.	
		Barkhausen criteria → An amplifier will work as oscillator if and only if it satisfies a set of conditions called Barkhausen criteria	For correct explaination 4 Marks
		 Block diag. of oscr	

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MODEL ANSWERS AND MARKING SCHEME (ODD 2019)

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.6	b)	For an oscillator circuit there is no i/p signal vs hence the feedback signal vf itself should be sufficient to maintain the oscillations. Barkhausen criteria is that in order to produce contineous undamped oscillations at the o/p of an amplifier the positive feedback should be $\beta \cdot Av = 1$ The overall volt gain of +ve feedback amplifier is given by $$Av' = \frac{Av}{1 - \beta \cdot Av}$$ where Av = gain of an amplifier without feedback $\beta \cdot Av$ = product of feedback fraction an open loop gain In order to produce positive feedback the feedback network must provide a phase shift of 180° between the i/p and output signals.	

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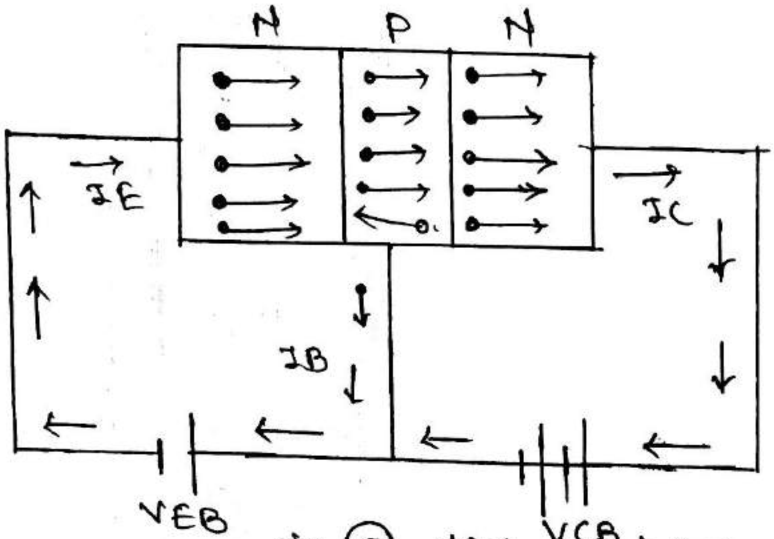
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.4	b)	and 180° phase is provided by amplifier so as to provide a signal with a phase shift of 360° or 0° at the amplifier input. The above two condition for positive feedback (i,e $\beta \cdot A_V = 1$ and the net phase shift around the loop equal to 360° or 0°) are called Barkhausen criteria for oscillations. Mathematically Barkhausen criteria is also stated as $\beta \cdot A_V = 1$, $\angle \beta \cdot A_V = 0°$	
Q.4	c)	State and explain selection criteria of transducer (any six)	For each correct criteria 1 Mark
	Ans:	1) Operating principle - Transducer is selected on the basis of operating principle used may be resistive, capacitive inductive	

SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.4	c)	2) Loding effect - The transducer should be selected such that is should not affect the value of the parameter under measurement 3) Environmental considerations → While selecting the transducers it is necessary to consider the environmental parameters like humidity, shocks, vibrations corrosion, moist. 4) Errors → Transducer should maintain the expected i/p and output relationship as described by it's transfer function so as to avoid errors. 5) Accuracy → It should work with high degree of accuracy under operating conditions. calibration and repeatability are the important parameters for good accuracy 6) Simplicity, Reliabity and low maintenance → A transducer should be selected it's simplicity, reliability and maintenance cost.	

SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.4	C	7) Time span → The time span indicates the time period for which a transducer works reliably. according to application transducer should be selected so that it will work properly for the desired time span. 8) cost and availability → general factors involved in selection are cost and availability	
Q.5	a)	Draw and explain working of NPN transistor.	For valid diagram 3 marks
	Ans:-	 Fig (a) NPN transistor	

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.5	a)	Fig ① shows circuit diagram for NPN transistor with forward bias to base emitter junction and Reverse bias to base collector junction. The forward bias causes the electrons in the N type emitter to flow towards the base. This constitutes the emitter current IE. As these electrons flow through P type Base, they tend to combine with holes. As the base is lightly doped and very thin therefore only a few electrons (less than 5%) combine with holes to constitute base current IB. The remaining 95% of electrons cross over into the collector region to constitute collector current IC. In this way almost entire emitter current flows in the collector circuit. So sum of the Collecter current and Base current is equal to the emitter current. It is given by $I_E = I_B + I_C$	For Explaination 3 Marks

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MODEL ANSWERS AND MARKING SCHEME (ODD 2019)

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q. 5	b)	i) Determine the decimal number represented by given binary number	For correct Answer 3 Mark each.
	Ans:	$(1101.0101)_2 = 1\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0 . 0\times2^{-1} + 1\times2^{-2} + 0\times2^{-3} + 1\times2^{-4}$ $= 8 + 4 + 0 + 1 . 0 + \frac{1}{4} + 0 + \frac{1}{32}$ $(1101.0101) = (13.3125)_{10}$	
		ii) convert $(247)_{10}$ into octal <table><tr><th></th><th>Quotient</th><th>Remainder</th></tr><tr><td>$\frac{247}{8}$</td><td>30</td><td>7</td></tr><tr><td>$\frac{30}{8}$</td><td>3</td><td>6</td></tr><tr><td>$\frac{3}{8}$</td><td>0</td><td>3</td></tr></table> $(247)_{10} = (367)_8$	

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MODEL ANSWERS AND MARKING SCHEME(ODD 2019)

COURSE NAME: ELEMENTS OF ELECTRONICS ENGINEERING

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.5	c)	Explain Working principle of Thermocouple	
	Ans:	Thermocouple is a Thermoelectric transducer which convert thermal energy Into an electrical energy. Thermocouple is used as primary transducer for temperature measurement in which change in temperature are directly converted into an electrical signal.	For diagram 2 Marks

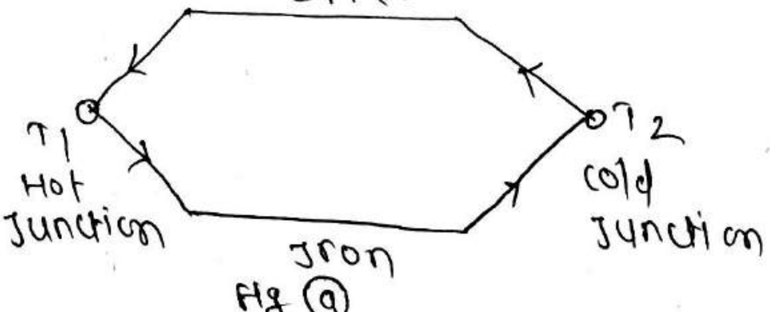

Fig (a)

		Seebeck effect → In 1821 the great scientist prof seebeck discovered that if The two wires of different Metals are Joined together forming closed circuit and if two junctions formed are at different temperature, an electric current flow around a closed circuit This is called seebeck effect	For explaination 04 Marks

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.5	c)	He also observed that if the two metals used are copper and iron, then the current flows from copper to iron at hot junction and from iron to copper at cold junction at shown in fig (a) If the copper wires is cut then emf appears across the open circuit as shown this emf is commonly known as seebeck emf. This emf is proportional to the difference in the temperature of the two junction. A thermocouple consist of pair of dissimilar metals wires joined together at one end, forming a hot junction and terminated at the other end known as reference or cold junction. when heat is applied to the hot junction a temperature difference exists between the hot & cold junction causing generation emf. The magnitude of this emf depends on the material used for the wires and the temperature difference between the two junctions.	

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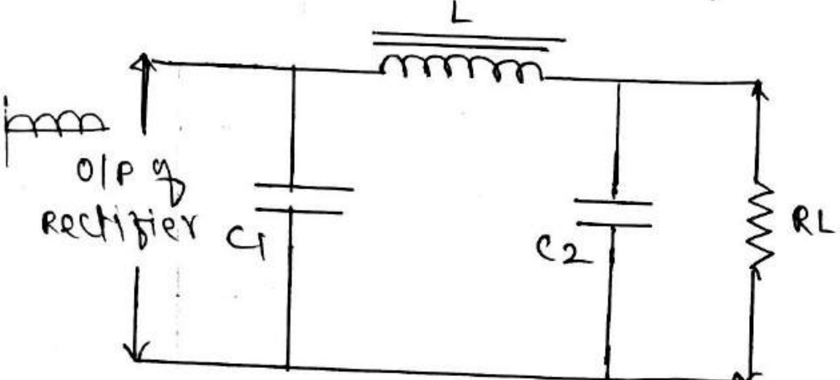
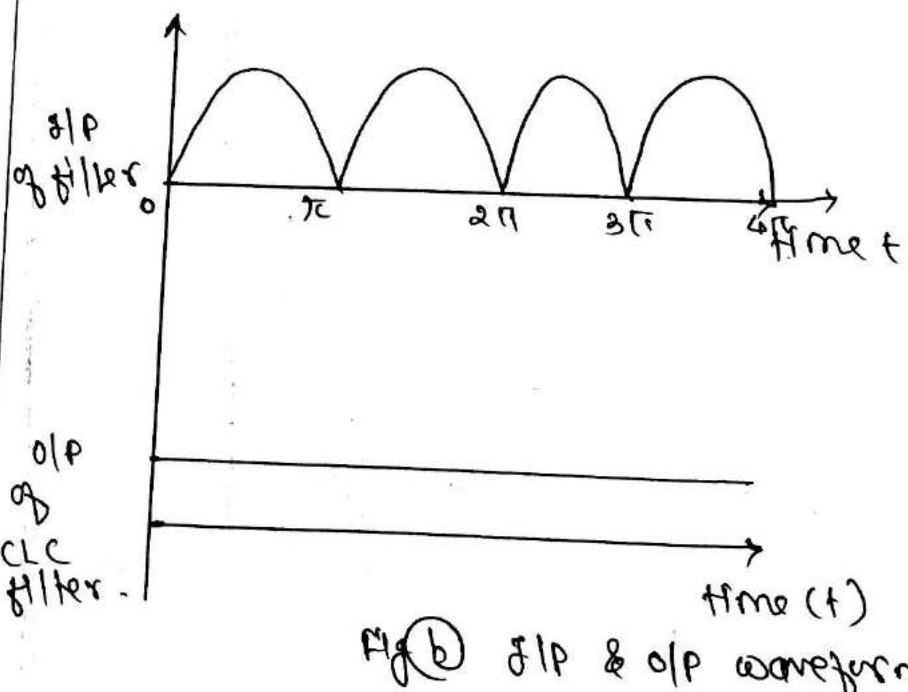
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.6	a)	Draw and explain working of π filter with it's input and output waveforms	
	Ans:	 Fig (a) circuit diagram	For correct ckt diagram 2 Marks
		 Fig (b) I/P & O/P waveforms	For correct waveforms 2 Marks

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.6	a)	Fig ⓐ shows the circuit diagram of π filter and ⓑ shows the I/P & o/p waveforms for π filter. A filter which uses two capacitor and one inductor is called CLC filter or π filter. It consist of two capacitor C_1 & C_2 which is connected in shunt & one inductor L connected in series betn two capacitors. The o/p of Rectifier is connected as input to capacitor C_1. capacitor C_1 offers low reactance to ac component of rectifier o/p but it offers infinite reactance to dc component so C_1 bypasses ac component and blocks dc component. Inductor offeres a high reactance to ac component of rectifier output but zero reactance to the dc component therefore it allows the dc component to pass through it and blocks the ac component which could not be bypassed by capacitor C_1. capacitor C_2 bypasses the ac component of Rectifier output which could not be blocked by inductor L. As result of this we will get pure dc at o/p.	for valid working 2 MARKS

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MODEL ANSWERS AND MARKING SCHEME (ODD 2019)

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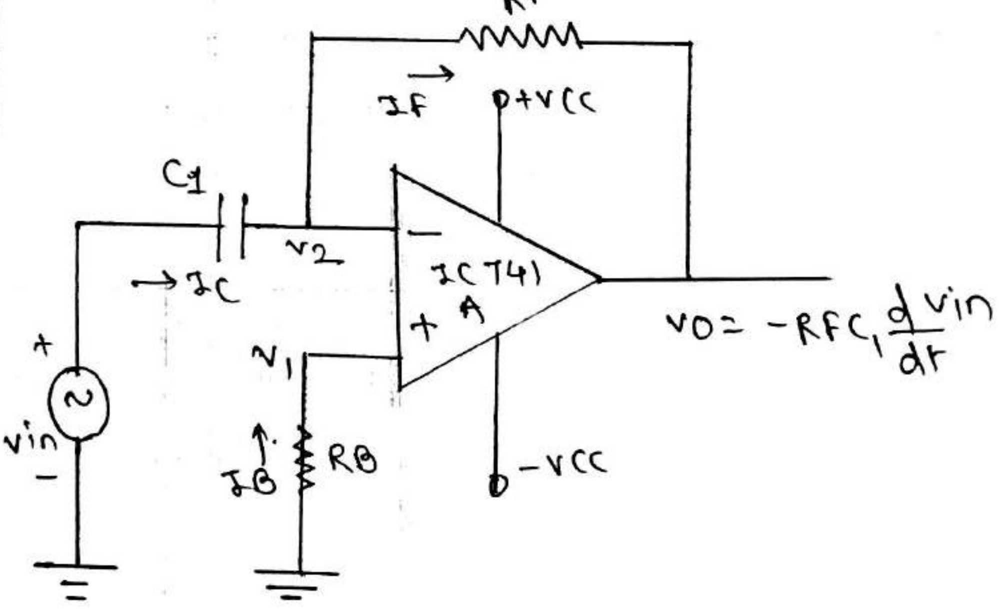
SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q. 6	b)	Draw the circuit diagram of Op-Amp as differentiator and explain it with it's output expression.	For correct diagram 3 Marks
	Ans:	 Fig: circuit diagram of OP-AMP as differentiater	
		Derivation →: by KCL $I_C = I_B + I_f$ but $I_B \simeq 0$ $\therefore I_C = I_f$ —— (1)	For derivation 3 Marks

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.6	b)	The basic Relation between current through and voltage across capacitor is given by $$Ic = c \frac{dvc}{dt}$$ $$\therefore Ic = C_1 \frac{dvc}{dt} \quad \text{—— (2)}$$ The voltage across C_1 is given by $$V.C = vin - v_2$$ put the value of vc in eqn (2) $$\therefore Ic = C_1 \frac{d(vin - v_2)}{dt}$$ Now let us obtained the expression for current IF $$IF = \frac{v_2 - v_0}{RF}$$ but Ic & IF are equal from eqn (1)	

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.6	b)	$C_1 \frac{d}{dt}(V_{in} - V_2) = \frac{V_2 - V_o}{R_F}$ — (3) by virtual ground concept $V_1 = V_2 = 0$ put this value in eq^n (3) $\therefore \frac{C_1 d}{dt}(V_{in} - 0) = \frac{0 - V_o}{R_F}$ $\therefore \frac{C_1 dV_{in}}{dt} = \frac{-V_o}{R_F}$ $\therefore \boxed{V_o = -R_F C_1 \frac{dV_{in}}{dt}}$ Thus the o/p voltage is differentiation of i/p voltage.	

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MODEL ANSWERS AND MARKING SCHEME(ODD 2019)

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
Q.6	c)	Draw the block diagram of CRO and states any four Applications of CRO	
	Ans:	(see diagram below)	For correct diagram 3 Marks

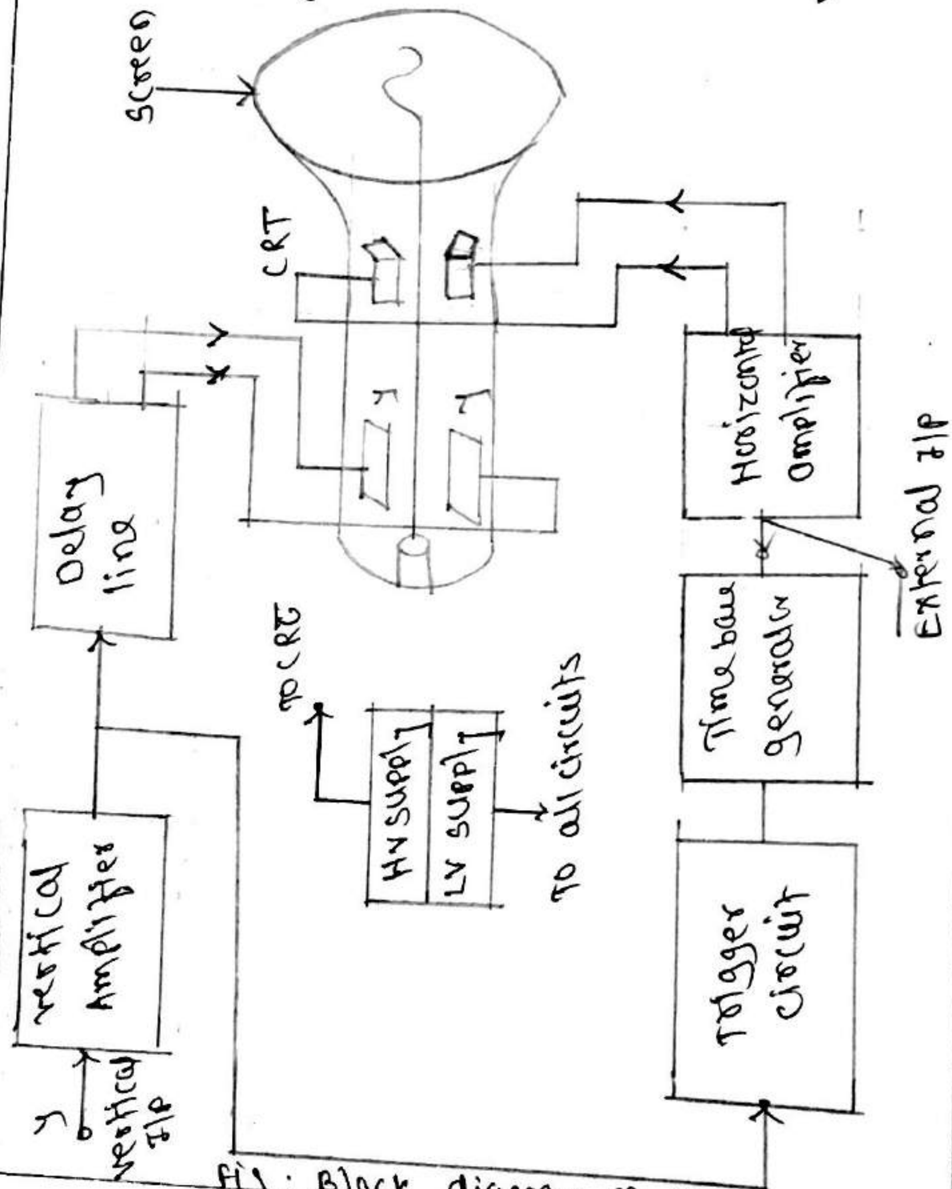

Fig: Block diagram of CRO.

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SR.NO	SUB QUE.	MODEL ANSWERS	MARKING SCHEME
		Four Application of CRO are as follows. i) In Laboratory :→ CRO can be used in laboratory for the measurement of AC/dc voltage, AC/dc current, frequency, phase. ii) In Radar → CRO is used in Radar for giving the visual indication of target such as aeroplane, ship etc. iii) In Television → In TV Reciever A CRT along with associated sweep circuit is used for the creation of image, on the CRT picture tube. iv) In Medical science → CRO is used in Electrocardiogram (ECG), Electromyogram (EMG) and Electroencephallogram (EEG). The ECG is used for the diagnosis of heart condition of patient. EEG is used to study the brain condn of patient.	For correct Applications (2M) each Appln ½ Marks

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		v) In Radio Work → CRO is used to trace and measure a signal throughout the RF IF, and AF channels of Radio and Television Reciever vi) In Industry → CRO is used in Electronic Industry for measurement of AC/dc voltage across different components of working circuit.	