KLS Vishwanathrao Deshpande Institute of Technology

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

University / Model Question Paper
Scheme & Solution

Faculty Name	:	RAHUL. C. M.
Course Name	:	Introduction to Electronics & Communication.
Course Code	:	BESCK104C.
Year of Question Paper	:	2023-24 (Jan)
Date of Submission	:	12/04/2024.

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Dean (Acad.)

CBCS SCHEME

USN | | | | | | | | | | |

BESCK104C/BESCKC104

First Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Introduction to Electronics and Communication

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is Regulated power supply? With neat block diagram, explain the individual blocks.	8	L2	CO1
	b.	What is a rectifier? With neat circuit diagram and output waveforms, explain full wave bridge rectifier with capacitor filter.	8	L2	CO1
	c.	With circuit diagram brief out the operation of voltage doubler.	4	L2	CO1
		OR			
Q.2	a.	Draw the circuit diagram of voltage regulator and explain the operation.	7	L2	CO1
	b.	Explain the concept of negative feedback amplifier with relevant equations and diagrams.	5	L2	CO1
	c.	Explain Frequency response of RC coupled amplifier.	8	L2	CO1
		Module – 2			
Q.3	a.	Explain the Barkhausen criteria for oscillations. In wein bridge oscillator if $C_1 = C_2 = 200nF$ determine the frequency of oscillation when $R_1 = R_2 = 4k\Omega$.	7	L3	CO2
	b.	With neat circuit diagram, explain the operation of ladder network oscillator.	7	L2	CO2
	c.	Explain the operation of single stage Astable multivibrator with its circuit diagram.	6	L2	CO2
		OR			
Q.4	a.	List out the Ideal characteristics of an op-amp.	7	L2	CO2
	b.	Explain the following with respect to operational amplifier, i) Inverting amplifier ii) Integrator.	8	L2	CO2
	c.	An operational amplifier operating with negative feedback produces an output voltage of 2V when supplied with an input of 400μV. Determine the value of closed – loop voltage gain and express the answer in decibels.	5	L3	CO2
		Module – 3			
Q.5	a.	Convert the following : i) $(FACE)_{16} = (\quad)_{10}$ ii) $(65.45)_{10} = (\quad)_2$ iii) $(1111011011011.11011)_2 = (\quad)_8$ iv) $(2604.10546875)_{10} = (\quad)_{16}$	8	L3	CO3

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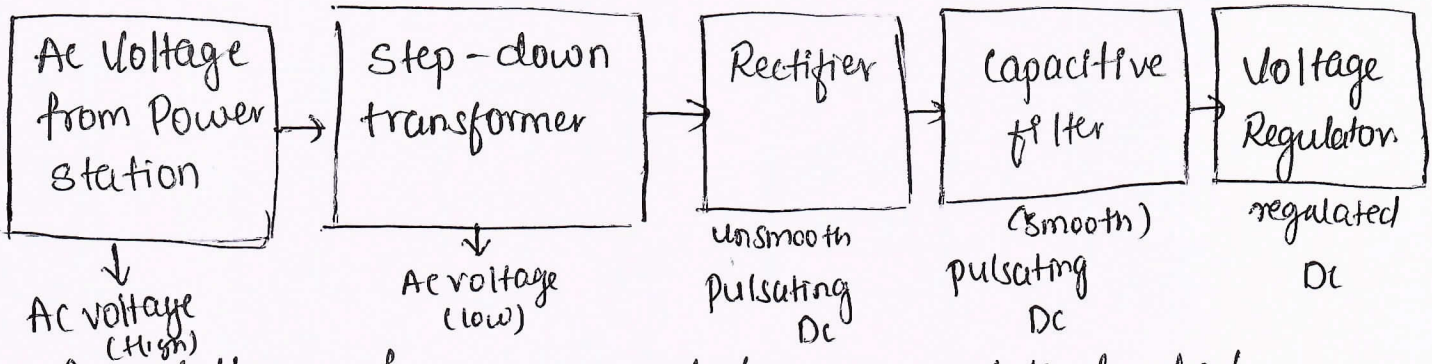
	b.	Perform the following : i) $(1010100)_2 - (1000100)_2$ using 2's compliment. ii) $(4456)_{10} - (34324)_{10}$ using 10's compliment method.	**6**	**L3**	**CO3**
	c.	State and prove De – Morgan's theorems with its truth table.	**6**	**L2**	**CO3**
		OR			
Q.6	**a.**	Implement the Boolean functions using logic gates. i) $F_1 = x + y'z$ ii) $x'y'z + x'yz + xy'$	**6**	**L3**	**CO3**
	b.	Write the step by step procedure to design a combinational circuit.	**6**	**L2**	**CO3**
	c.	Implement full adder circuit with its truth table and draw the logic diagram of sum and carry.	**8**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	What is an embedded system? Compare embedded system and General computing systems.	**7**	**L2**	**CO4**
	b.	Explain classification of embedded systems.	**7**	**L2**	**CO4**
	c.	What is the difference between RISC and CISC processors?	**6**	**L2**	**CO4**
		OR			
Q.8	**a.**	Discuss major application areas of embedded systems with examples.	**7**	**L2**	**CO4**
	b.	Write short note on : i) Transducers ii) Sensors iii) Actuators.	**6**	**L2**	**CO4**
	c.	Write a short note on 7-segment LED display.	**7**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	With neat block diagram, explain modern communication system.	**8**	**L2**	**CO5**
	b.	Write a note on Hard wired channel and soft wired channel.	**6**	**L2**	**CO5**
	c.	Explain with a neat diagram, the concept of Radio wave propagation and its different types.	**6**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain Amplitude Modulation (AM) and Frequency Modulation (FM) with neat waveforms.	**8**	**L2**	**CO5**
	b.	List out the advantages of Digital communication over Analog communication.	**6**	**L2**	**CO5**
	c.	Explain different multiple Access Techniques.	**6**	**L2**	**CO5**

* * * * *

Module - 1

Q1 a. What is Regulated power Supply? with neat block diagram Explain the individual blocks. 8M

→ Regulated power Supply: The basic diagram of DC power is step-down transformer, Rectifier, reservior/ Smoothing filter, and a voltage regulator.



* Ac Voltage from power station is relatively high.
* step down transformer is used to convert this to a low voltage
* Then the voltage from transformer is passed to rectifier using conventional silicon rectifier diodes which produces an unsmoothed Dc or pulsating DC as output.
* This is then smoothed with the capacitive filter. which gives smooth pulsating DC
* Then regulated by voltage regulator. So that it remains relatively constant is site of variation into the both load current and incoming main voltage

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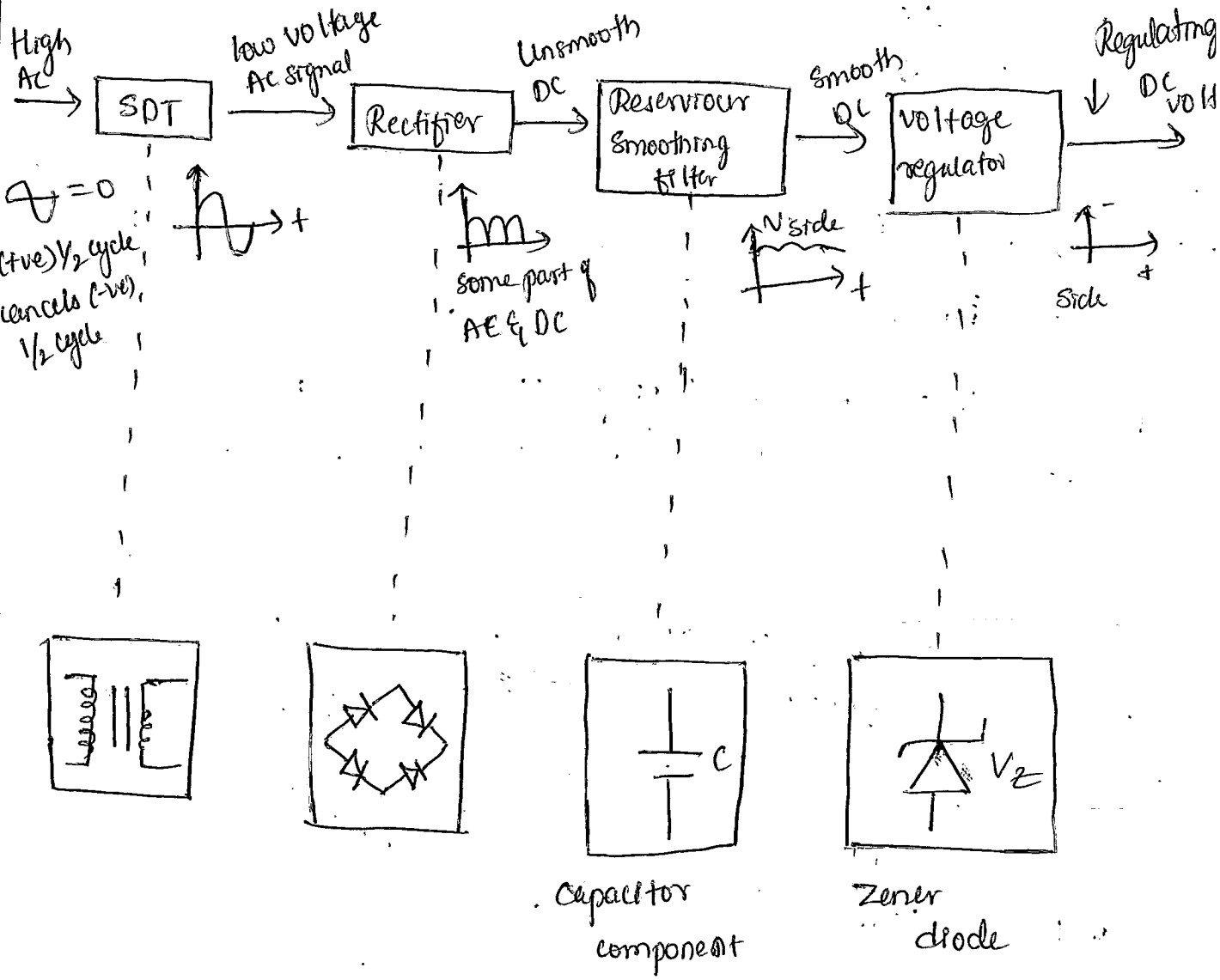


* The iron cored step down transformer feeds a rectifier arrangement.
* The output of the rectifier is then applied to high-value capacitor.
* This capacitor stores a considerate amount of charge and is being constantly <u>discharged</u> by rectifier arrangements.
* The capacitor also helps to a smooth out the voltage pulsating produced by the rectifier.
* Finally, a stabilising circuit provides a constant output voltage.

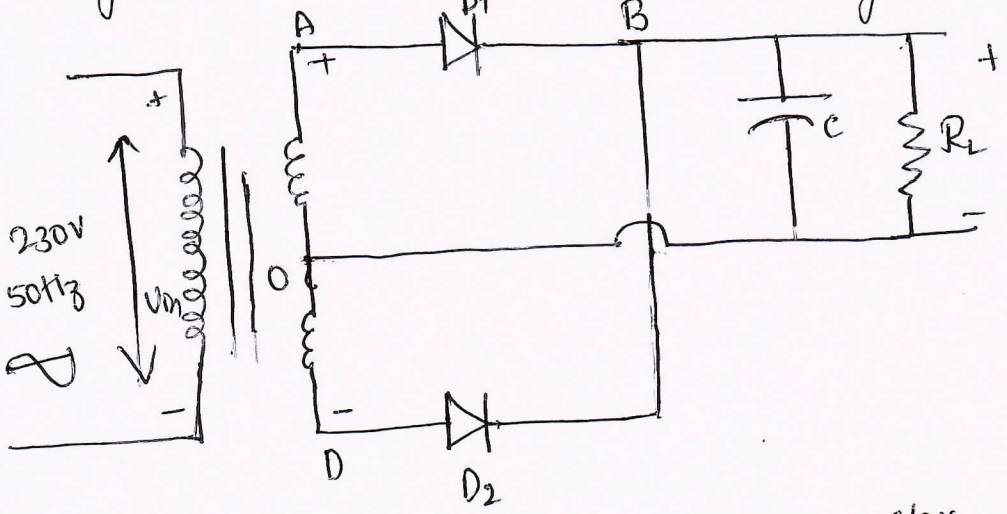
b. What is a rectifier? with neat circuit diagram and output waveforms, explain full wave bridge rectifier with capacitor filter.

→ Rectifier :- Semiconductor diodes are commonly used to convert AC to pulsating direct current (DC) are refferend to as rectifier.

8M

or

Rectifier on the circuit which converts low voltage Ac signal into unsmooted Dc signal voltage.



* figure shows how a reservior capacitor can be added to ensure that the output voltage remains at or near the peak voltage when where that diodes are not conducting.

→ This component operates in exactly the same way as for the half-wave circuit ie || charges to approximate 16.3V at the peak of the positive half wave.

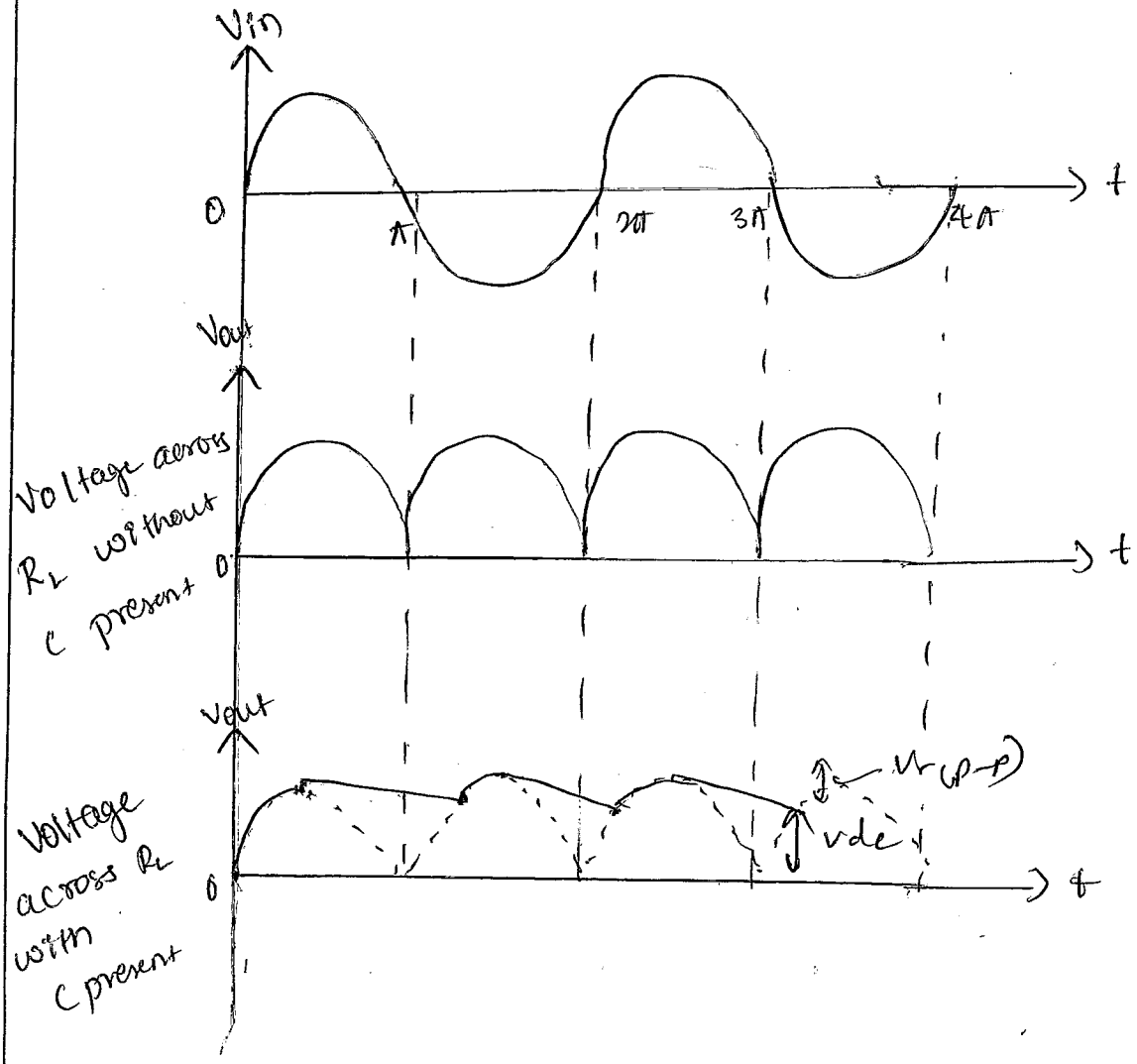
→ In the circuit, the series resistance compress the secondary winding resistance together with the forward resistance of the devicle and resistance of the wiring and connections.

→ Hence C charges very rapidly as soon as either D_1 or D_2 starts to conduct.

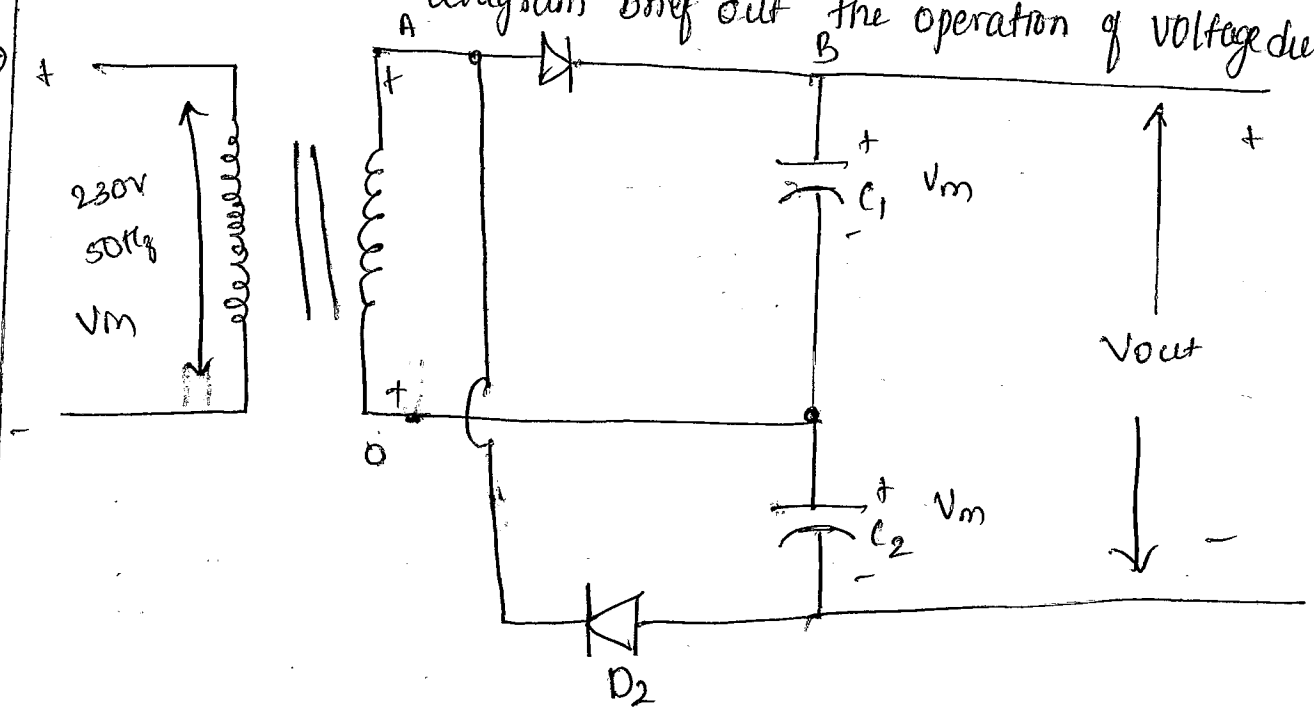
→ The time required for C_1 to discharge is very much greater and discharge time constant is determined by the capacitive value and the load Resistance R_L.

→ In Pratice, R_L is very much larger than the resistance of the secondary circuit and hence C_1 takes an appreciate time to discharge.

→ During this time, D_1 & D_2 will be reverse biased and held on a non-conducting state. As a consequence the only discharge path for C_1 is through R_L



C. With a circuit diagram brief out the operation of voltage dubler.



4M

During the + half cycle Diode D_1 is forward biased D_2 is reversed biased

Apply KVL to output side

$$-V_{out_1} + V_{C_1} + V_{C_2} = 0$$

$$V_{out_1} = V_{C_1} + V_{C_2}$$

$$= V_m + 0$$

$$\boxed{V_{out_1} = V_m}$$

During negative half cycle Diode D_1 is reversed biased diode D_2 is forward biased capacitor C_2 charges to the peak value of input voltage

Apply KVL to output side

$$-V_{out_1} + V_{C_1} + V_{C_2} = 0$$

$$V_{out_2} = V_{C_1} + V_{C_2}$$

$$= 0 + V_m$$

$$\boxed{V_{out_2} = V_m}$$

The output voltage thus is given by

$$V_{out} = V_{out_1} + V_{out_2}$$

$$= V_m + V_m$$

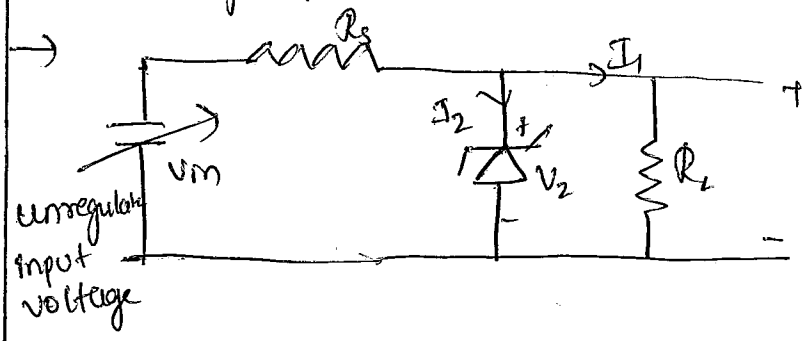
$$V_{out} = 2V_m$$

Roll C. 11

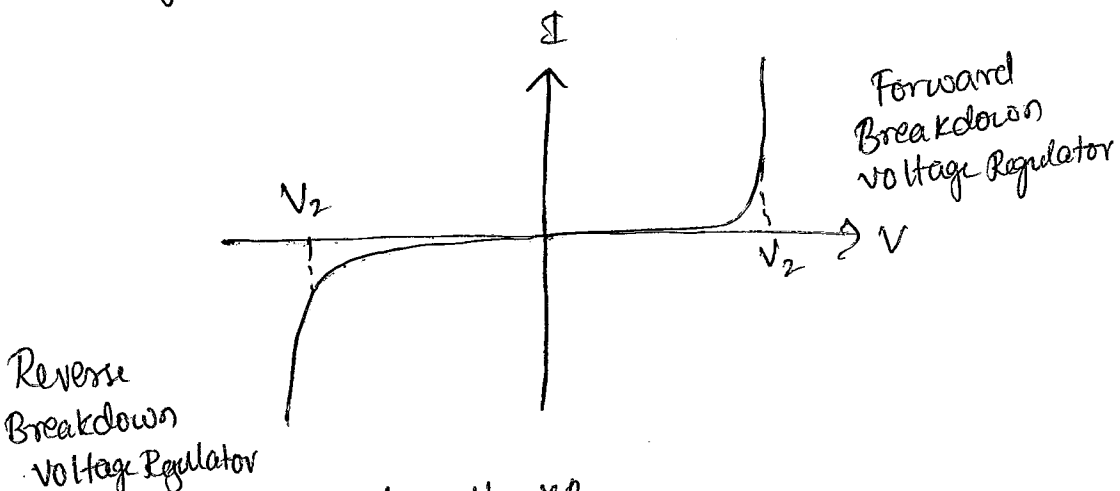
(OR)

Q2. a. Draw the circuit diagram of voltage regulator and explain the operation.

7M



Voltage Regulator is a circuit that maintain a constant dc output voltage irrespective of variation in the input line voltage or in the load.



$$V_o = \frac{V_{IN} \times R_L}{R_s + R_L}$$

* Input voltage is less than regulating voltage then zener diode acts as off state the output voltage.

$$V_{out} = \frac{V_{IN} \times R_L}{R_s + R_L} \rightarrow (1)$$

* when input voltage exceeds the regulating voltage then zener diode is in the ON, state the output voltage $V_{out} = V_z \rightarrow (2)$

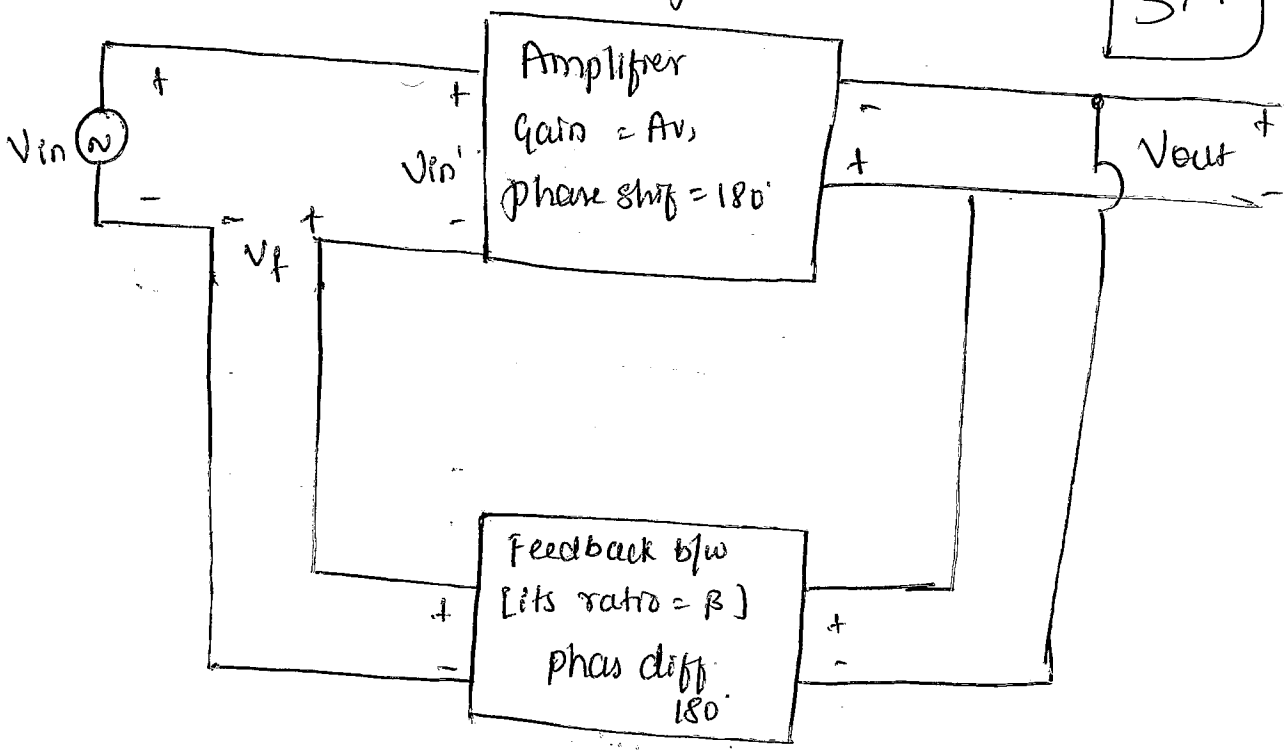
The max value of R_s can be determined from eqn

$$V_{out} = \frac{V_{IN} \times R_L}{R_s + R_L}, \quad V_{out} = V_z$$

b. Explain the concept of negative feedback amplifier with relevant equations and diagram.

5M

→



By applying KVL on input side we get,

$-V_{in} + V_{in}' + \beta V_{out} = 0$

$V_{in}' = V_i - \beta V_{out}$ [$\because \beta V_{out} = V_f$]

$V_{in} = V_{in}' + \beta V_{out}$

$\because A_v = \frac{V_o}{V_{in}}$

$V_{out} = AV_{in}'$

$V_o = V_{in}' A_v$

$V_{out} = A_v \cdot V_{in}'$

overall gain of the amplifier :-

$A_f = \frac{V_o}{V_i}$

$= \frac{A_v \cdot V_{in}'}{V_{in}' + \beta V_{out}}$

$= \frac{A_v \cdot V_{in}'}{V_i' + \beta \cdot A_v \cdot V_{in}}$ $= \frac{A_v \cdot V_{in}'}{V_i'[1 + A_v \beta]}$

$$A_v = \frac{A}{1 + A_v \cdot \beta}$$

Refer C.M.

$$R_s + R_L = \frac{V_{IN} \times R_L}{V_{out}}$$

$$\boxed{R_{smax} = \frac{V_{IN} \times R_L - R_L}{V_{out}}} \rightarrow (3)$$

The min value of R_s can be

$$R_{smin} = \frac{V_{IN} - V_Z}{I_Z} \rightarrow (4) \quad \because P_{Zmax} = I_Z V_Z$$

$$= \frac{V_{IN} - V_Z}{\left(\frac{P_{Z\,max}}{V_Z}\right)} = \frac{(V_{IN} - V_Z) V_Z}{P_{Z\,max}}$$

$$\boxed{R_{s_{min}} = \frac{V_{IN} V_Z - V_Z^2}{P_{Z max}}}$$

Output resistance is the ratio of the change in output voltage to the output current.

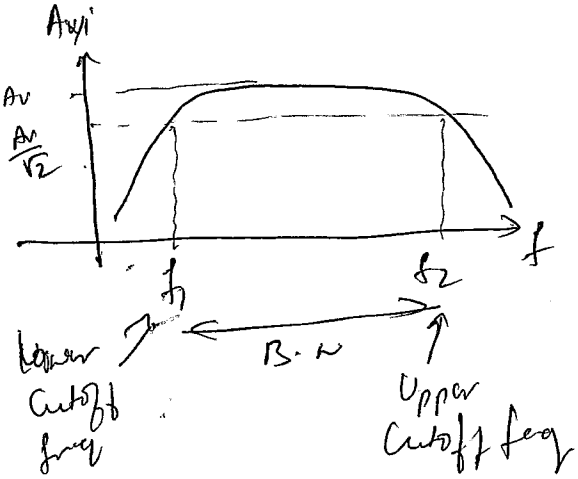
$$R_{out} = \frac{\Delta V_{out}}{\Delta I_{out}}$$

Regulation is the ratio of change in ouput voltage to the change in the input voltage.

Regulation : $\frac{\text{change in Output Voltage}}{\text{Change in Input voltage}} \times 100$

8M.

2 C.



- frequency Response indicates range of frequency over which gain drops 70.7% of it's mid band value ~~the gro~~
- The graph shows frequency response of RC-coupled amplifier
- frequency below F_1 and above F_2 are blocked by the amplifier.

7M

Q3 a. Explain the Barkhausen criteria for oscillations. In wein bridge oscillator if $C_1 = C_2 = 200nF$ determine the frequency of oscillation when $R_1 = R_2 = 4K\Omega$

Barkhausen criteria.

The overall loop gain of the circuit including Amplifier Section & feedback section must be 1.

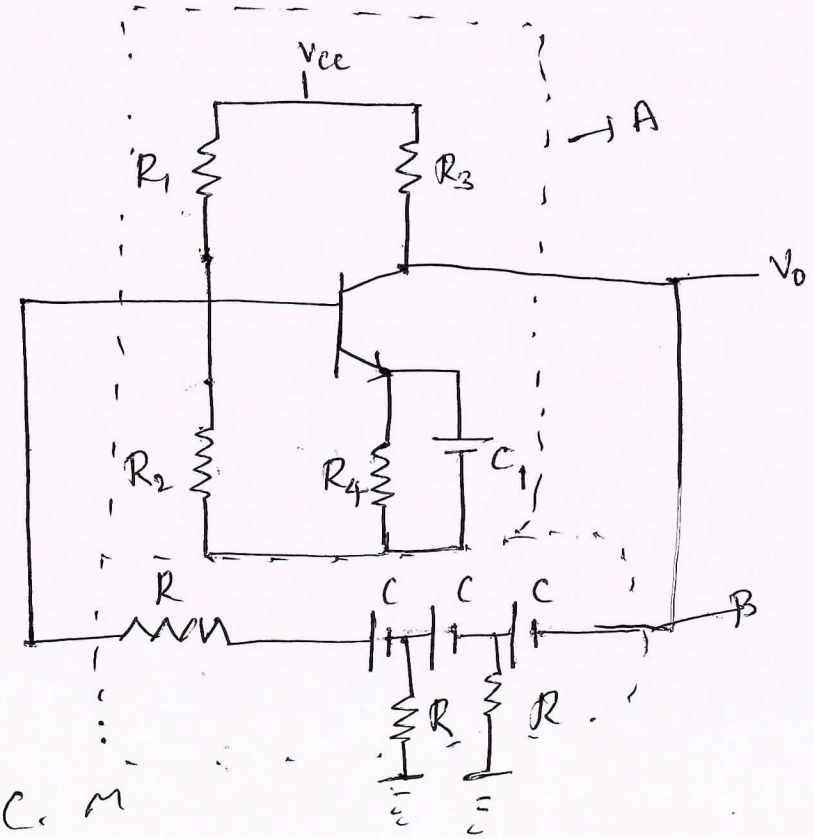
The overall loop phase shift must be equal to 0° or 360°.

$$f = \frac{1}{2\pi\sqrt{C_1 C_2 R_1 R_2}} = \frac{1}{2\pi RC} = \frac{1}{2\pi \times 200nF \times 4K\Omega}$$

$$= 198.91\ Hz.$$

b. With near circuit diagram, explain the operation of ladder network oscillator.

→ 7M



Refer C. M

→ The above circuit shows, Laddler Network Oscillator. Here transister Q_1, along with R_1, R_2, R_3 & R_4 will acts as voltage divide biased circuit (Amplifier Section). providing phase shift of 180°

→ The feedback network three Rc section where, each RC section with phase shift of 60° Hence overall feedback section phase shift = 360°

→ These overall with phase shift will become 360° or 0°

→ The condition for sustained oscillation is given by

$$f = \frac{1}{2\pi RC\sqrt{2n}}$$

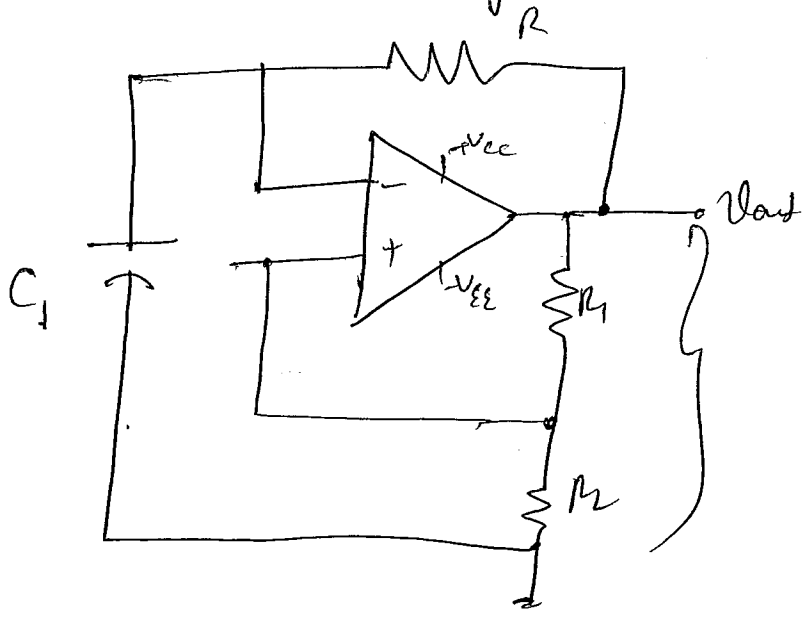
n = no. of Rc section

→ we get $f = \frac{1}{2\pi RC\sqrt{6}}$

c. Explain the operation of single stage Astable multivibr with its circuit diagram.

6 M.

→



→ Initially capacitor voltage, v = 0v Because of potential divider biased circuit R_1 & R_2 some + voltage is feed to Non Inverting ~~amplifier~~. Terminal.

→ Since NI Terminal is higher potential o/p opAmp will be in positive now capacitor starts charging.

→ when capacitor voltage exceeds the voltage at NIT voltage, inverting terminal as at higher potential, o/p of opAmp will be negative saturation

(OR)

Q4.

a. List out the Ideal characteristics of op-amp.

→ Ideal OpAmp:- [7M]

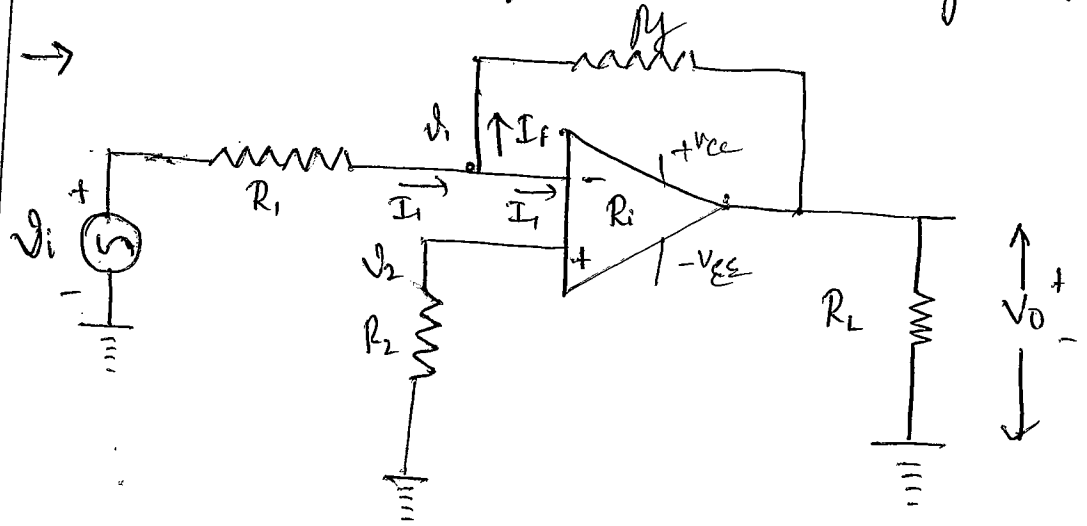
1. Open loop voltage Gain should be very high (ideally ∞)
2. The input resistance should be very high (∞)
3. o/p resistance should be very low.
4. Full Power Bandwidth should be as wide as possible (∞)
5. Slew Rate should be as large as possible (ideally ∞)
6. I/p offset should be as small as possible. (ideally 0)

Rohit C.M

b. Explain the following with respect to operational amplifier.

i) Inverting amplifier ii) Integrator. 8M

→



Applying KCL at V_1

$$I_i = I_1 + I_f \rightarrow (1)$$

Since, $R_i = \infty$, $I_1 \approx 0$

$$\therefore \boxed{I_i = I_f} \rightarrow (2)$$

$$\frac{V_{in} - V_1}{R_1} = \frac{V_1 - V_o}{R_f} \rightarrow (3)$$

By concept of virtual ground

$$V_2 = V_1 = 0V \rightarrow (4)$$

Substitute (4) in (3)

$$\frac{V_{in}}{R_1} = \frac{-V_o}{R_f}$$

A_v = open loop
G_v = closed loop.

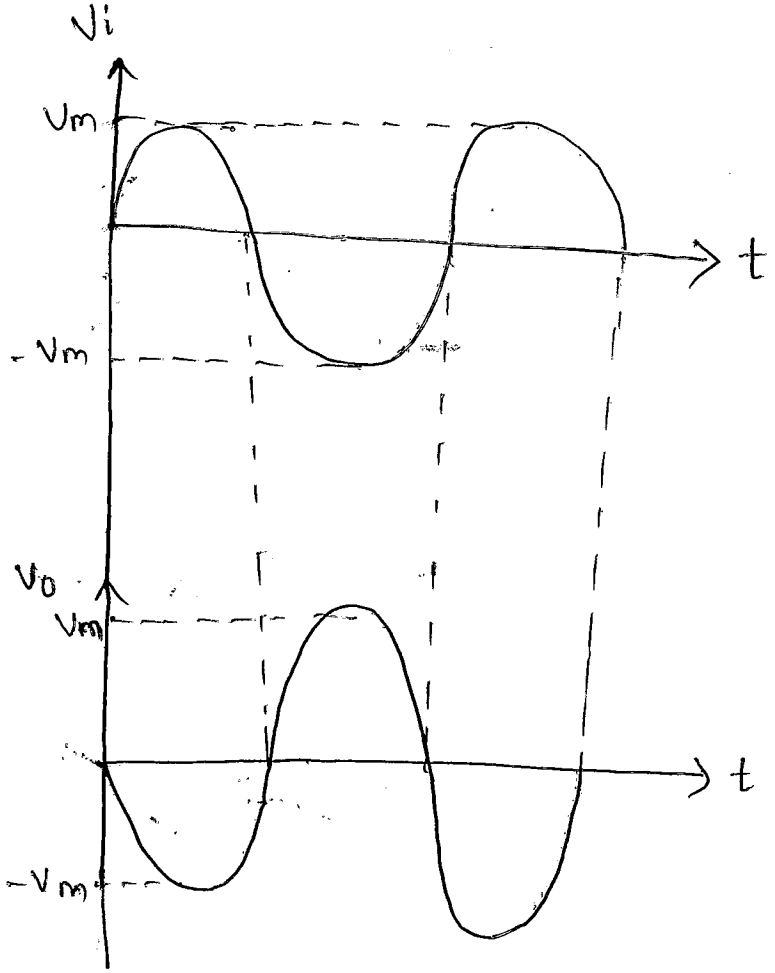
$$\boxed{V_o = \left(-\frac{R_f}{R_1}\right) V_{in}} \rightarrow (5)$$

$$\therefore \boxed{A_v = -\frac{R_f}{R_1}}$$ The gain of inverting Amplifier in given by.

$$= \boxed{G_v = \frac{-R_f}{R_1}}$$

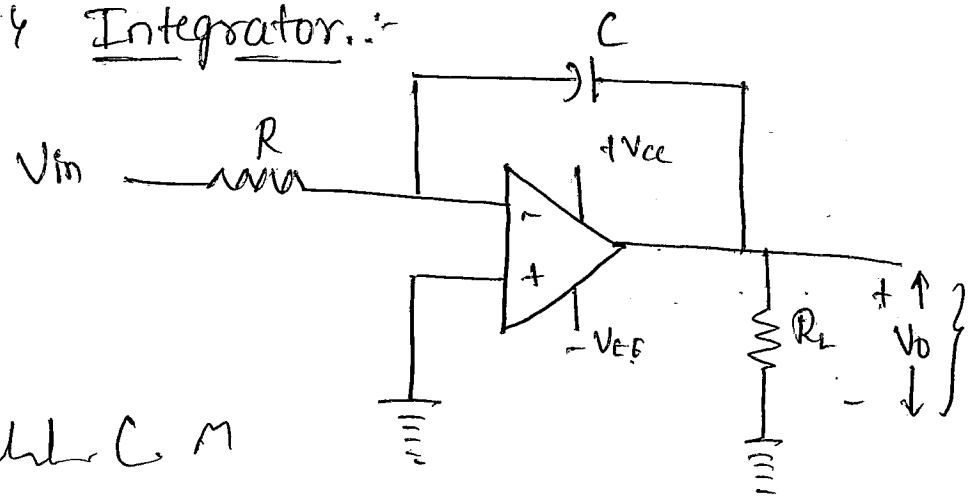
where (-) sign indicates 180° phase b/w input & o/p

$R_f = 10R_1$

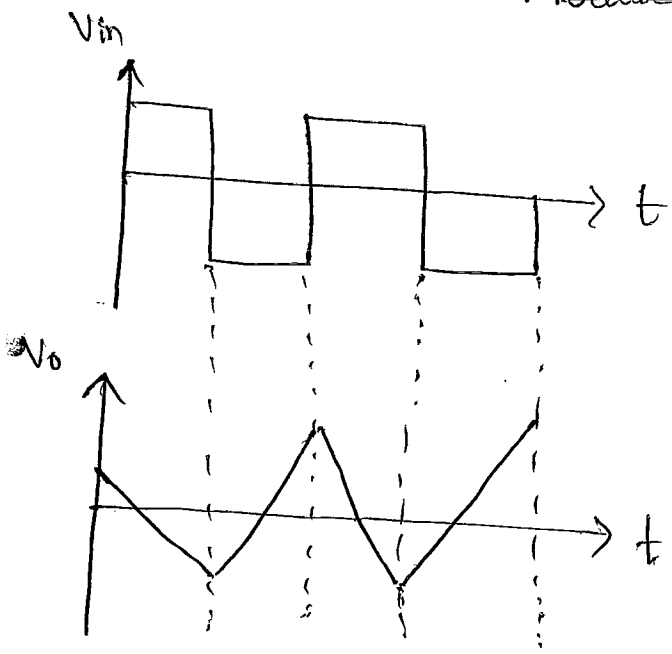


Here i/p signal is Applied to I i/p terminal via R_1; Non I he ground via R_2. R_f is applied to connected b/w output & input side. Since i/p signal to inverting terminal is called inverting Amplifier

iii) Integrator:-



~~Module - 2.~~



The circuit provides opposite function to that of difference here o/p is equivalent to area under the graph (input function).

If i/p v remain constantant o/p voltage will ramp down dependending on polarity of i/p.

C. ~~An Operational~~ Given, $V_{in} = 400\,\mu V$ [5M]

~~Vout = 2~~ $V_{out} = 2\,V$

we have open loop voltage gain by. $A_V = \frac{V_{out}}{V_{in}} = \frac{2\,V}{400 \times 10^{-6}}$

$$A_{V(\omega)} = 5000$$

$$A_{V(\omega)} = 20\log 5000$$

$$A_{V(\omega)} = 73.98\,dB$$

$$A_{(CL)} = 74\,dB.$$

Q5

a. convert the following:- 8M

i) $(FACE)_{16} = (\quad)_{10}$

→ $15\times16^3 + 10\times16^2 + 12\times16^1 + 14\times16^0$

$= (64206)_{10}$

ii) $(65.45)_{10} = (\quad)_2$

→

2	65	
2	32	− 1
2	16	− 0
2	8	− 0
2	4	− 0
2	2	− 0
	1	− 0

$0.45\times2 = 0.9$

$0.9\times2 = 1.8$

~~$1.8\times2 = 3$~~

$= (1000001.0110)_2$

iii) $(1111011011011.11011)_2 = (\quad)_8$

→ $(17333.66)_8$

iv) $(2604.1054\,6875)_{10} = (\quad)_{16}$

→

16	2604	
16	162	− 12
16	10	− 2

$0.1054\,6875\times16 = 1.6875$

$0.6875\times16 = 11$

$= (A2C.1B)_{16}$.

Rohit C M

b. Perform the following: [6M.]

i) $(1010100)_2 - (1000100)_2$ using 2's complement.

→ M = 1010100 N = 1000100

Step 1: Substituting r's complement for subtrahend

$= r^n - N$

$= N = 1000100$

$n = 7$

$r = 2$

$= 2^7 - (1000100)_2$

$= (10000000)_2 - (1000100)_2$

$= (111100)_2$

Step 2: Add result to Minuend

```
  1010100
  0111100
 ---------
 1|0010000
```

↑ Ignore

$= (0010000)_2$

ii) $(4456)_{10} - (34324)_{10}$ Using 10's complement.

step 1: Take r's complement of subtrahend

$N = 34324$

$n = 5$

$r = 10$

$= r^n - N$

$= 10^5 - 34324$

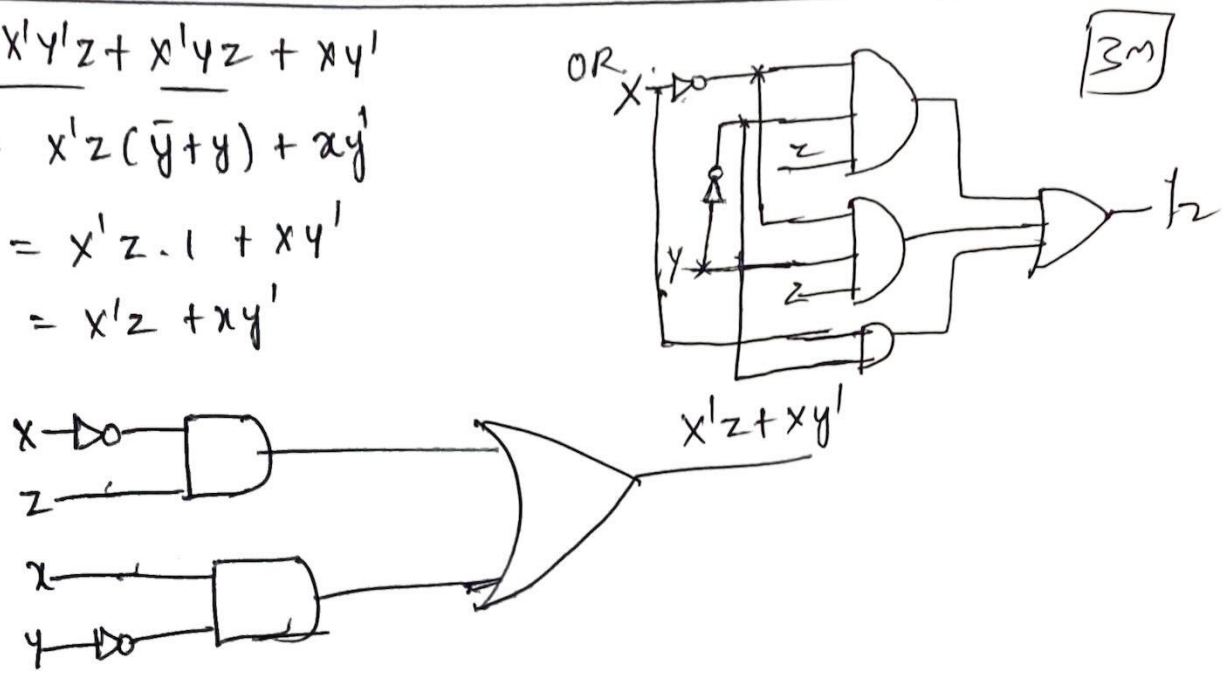
$= 65676$

(ii) $x'y'z + x'yz + xy'$

$= x'z(\bar{y}+y) + xy'$

$= x'z.1 + xy'$

$= x'z + xy'$



3M

b. write the step by step procedure to design a combinational circuit.

6M

→ Step 1: Identifying the number of inputs to the circuits

Step 2: ~~creat~~ Identifying the number of output from the circuit

Step 3: Creating the truth table i.e, we will create input column and list all the possible combination

Step 4: obtaining the Expression for output from the truth table

Step 5: Simplifying the ~~Expression for Output~~ boolean function and expression for each

Step 6: Implementing the circuit using Boolean function obtain by step 5.

Step 2: Add result to Minuend

$$\begin{array}{r} 6\ 04456 \\ 65676 \\ \hline 70132 \end{array}$$

Again r's complement for result

$N = 70132$ $\quad = r^n - N$

$n = 5$ $\quad = 10^5 - 70132$

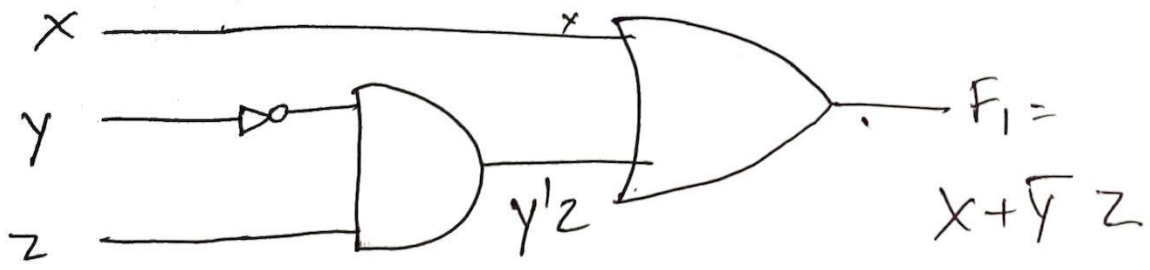
$r = 10$ $\quad = (-29868)_{10}$

(OR)

Q6. a. Implement the Boolean functions using logic gates.

If $F_1 = x + y'z$ [6M]

[3M]



5c. Demorgan's Theorm [6M]

$\overline{A+B} = \overline{A} \cdot \overline{B}$

$\overline{A \cdot B} = \overline{A} + \overline{B}$

A	B	A · B	$\overline{A \cdot B}$
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

A + B	$\overline{A+B}$	$\overline{A} \cdot \overline{B}$	$\overline{A} + \overline{B}$
0	1	1	1
1	0	0	1
1	0	0	1
1	0	0	0

c. Implement full adder circuit with its truth table and draw the logic diagram of sum and carry.

→ Full adder on a logical circuit that perform arthematic sum of 3 input bit's

8M

A B C	Sum	Carry
0 0 0	0	0
0 0 1	1	0
1 0 1	1	0
0 1 1	0	1
1 0 0	1	0
1 0 1	0	1
1 1 0	0	1
1 1 1	1	1

The Expression of Sum is given by

$$S = A'B'C + A'BC' + AB'C' + ABC$$

$$S = C(A'B' + AB) + C'(A'B + AB')$$

let $A'B + AB' = y = A \oplus B$

$A'B' + AB = y' = A \oplus B$

$C(y') + C'y$

$C \oplus y$

$= C \oplus A \oplus B \quad [\because y = A \oplus B]$

The Expression of Carry is given by

$$Cy = A'BC + AB'C + ABC' + ABC$$

$$= A'BC + AB'C + AB(C + C')$$

$$= A'BC + AB'C + AB$$

$$= A'BC + A(B'C + B)$$

$$= A'BC + A(B + C)$$

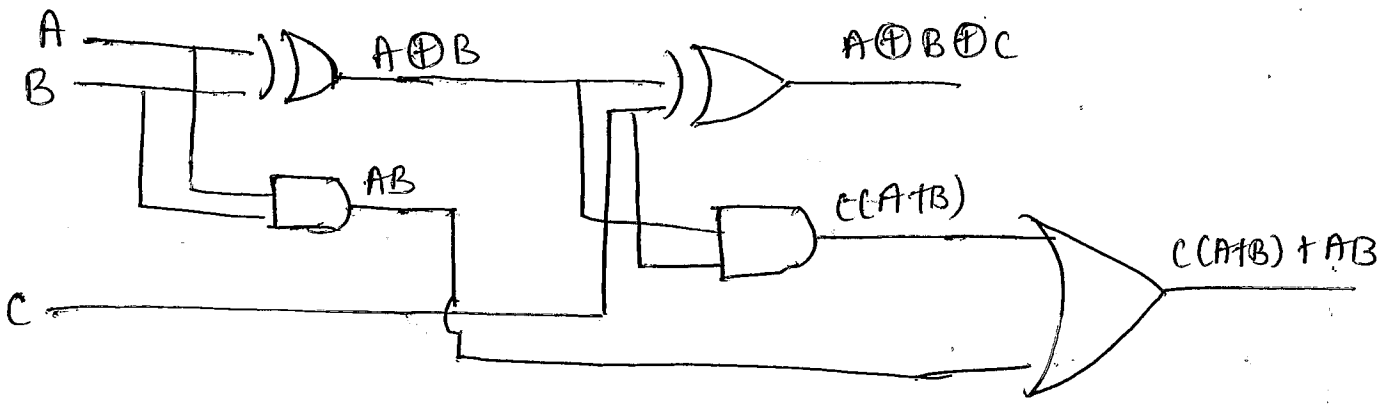
$$= A'BC + AB + AC$$

$$= B(A'C + A) + AC$$

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

$$= AB + BC + AC$$

Ref. C. M


A
B
A⊕B
A⊕B⊕C
AB
C(A+B)
C(A+B)+AB
C

Q7. a. What is an embedded System? Compare embedded system and General computing systems. [7M]

→ An Embedded System is an electronic ~~specific~~ / electro ~~function~~ mechanical System designed to perform a specific function and it's combination of both hardware and firmware (software).

General Purpose Computing System	Embedded System.
* It contains a General purpose operating system (GPOS)	* May or May not contains operating System for function
* Applications are a alterable (programable) by the user It is possible for the end User to reinstall the operating System	* The software of Es is pre-programmed and it is non-alterable by the end user
* performance is the key deciding function in the System	* Application Specific requirement are the key deciding factors Ex; performance, memory usage
* Less tailored towards reduced operating power requirements	* Highly tailored to take advantage of power saving mode supported by hardware OS.
* Need not be deterministic in execution behaviour	* Execution behaviour is deterministic for certain type of Es
* A System which is a combine of generic hardware and a GPOS for executing various appl^n	* A system which is combine of special purpose hardware of ES for executing specific set of appl^n

b. Explain Classification of Embedded System. [7M]

→ Based on Generation

* First Generation:- The early Es were built around 8 bit microprocessor & 4 bit microcontrollers
  - Ex: Digital telephone, Keypads

* Second Generation:

  There Es were built around 16 bit microprocessor & 8 or 16 bit microcontroller.

* The instruction set for second generation were much more complex & powerfull than the 1st generation.

* Third Generation:

  * These Es were built around 32 bit microprocessor & 16 bit microcontroller.
  * A new concept of application & domain specific processor controller like Digital signal. processor & Application Specific Integrated. Circuit [ASIC] come into picture.
  * The concept of instruction pipelining also evolved
  * The instruction set for processor became more complex.

* Fourth Generation.

  * These generation Es are making use of high performance real time embedded operating system for their functioning

  Ex; Small phone Device - Mobile Internal Device.

2→ Based on Complexity & performance.

* Small scale Es

- usually built around low performance & low cost 8 or 16 bit microprocessor / microcontroller.
- May or May not contain os for its functioning.

* Medium - Scale Es :

- usually built around medium performance & low cost 16 or 32 bit processor / controller.
- usually contain Eos for its functioning.

* Large - Scale Es

- usually built around high performance & high cost 32 or 64 bit microprocessor / microcontrol & co-units / hardware

C. what is the difference between RISC and CISE processors? [6M]

RISC	CISE
* Lesseed no of instruction	* Greater no of instruction.
* Instruction pipeling & increase execution speed	* No instruction pipelining feature
* Orthogonal instruction set	* Non-Orthogonal Instruction set
* Operations are performed an resistor only	* Operations are performed on register or memories depending on the instruction
* A large no of registors available	* Limitted no of general purpose registors
* Signal fixed length instruction	* Variable length instruction
* with hardword - Architecture	* Can be Harwaard or Non-Neuman Architecture.

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(OR)

7M

Q8 a. Discuss major application area of embedded System with example.

→ ① consumer Electronics : CamCordes, cameras etc.

② Household appliance : Television, DVD players, washing machine, fridge . microwave oven

③ Home automation & security System:

Air conditioners, sprinklers, intruder . detection alarm closed circuit, TV cameras.

④ Automotive industry : Anticlock breaking System (ABS) engine control, ignition System, automatic navigation System etc.

⑤ Telecom :- cellular telephones, telephone switches, handse multimedia appl^n etc.

⑥ computer Networking System:- Network routers, switches hub: , firewall etc.

⑦ Health care : Different kinds of scanners, EEG, ECG machines etc.

6M

b. write short note on:

i) Transducers: These are device that converts energy of form into equivalent electrical System vise - versa.

Ex: A loud speaker is a electrical current into audiab -le sound.

These may be used as both input & output device from the above mentioned example speaker is an output transdu -cer & microphones is an input transducer.

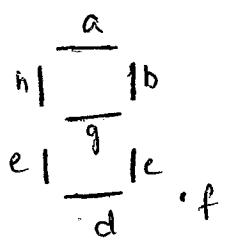
ii) Sensors: It is special kind of i/p transducer sensor is a device that converts a physical quantity into electrical signal. It can be catagerised as active or passive

* A active sensor generates current or voltage as output
* A passive require source of current or voltage as output for to convert physical quantity into electrical signal.

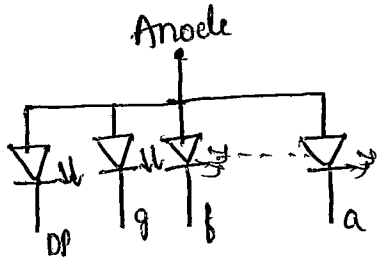
iii) Actuators:

It is an output transducer which converts an electrical Quantity into physical quantity. It is basically an output element.

c. write a short note on 7-segment LED display? [7M]



(a)



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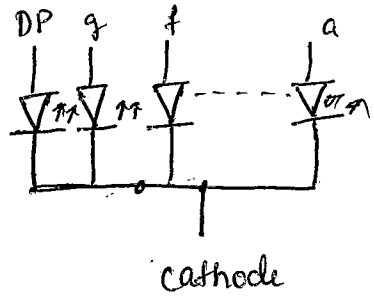

(c)

a) 7-segment LED display
b) common Anode LED display
c) common cathode LED display.

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* It is an o/p device for displaying ∞ numeric value.
* It contains 8 LED segement arranged in special form
* Out of 8 LED's 7 LED's are used for displaying ∞ numeric character & 1 LED for displaying decimal pt.

7 segment LED's are available in 2 configuration

a) common anode b) common cathode.

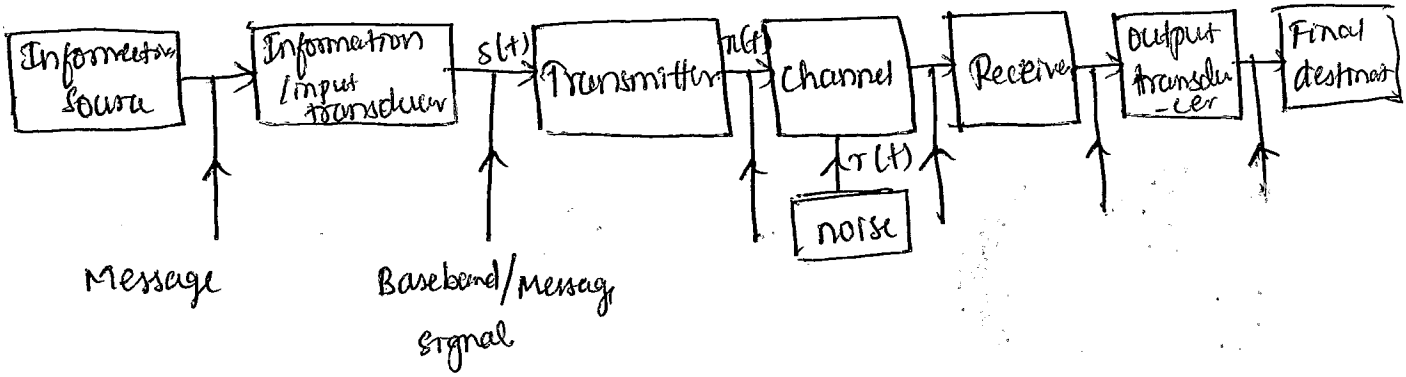
In common anode configuration Anode of 8 LED's are connected together (to supply) Hence in order to turn on LED should go low.

* In common cathode configuration cathode of 8 LED's are connected together (to ground) Hence is order to turn on LED the corresponding anode of the LED should go high.

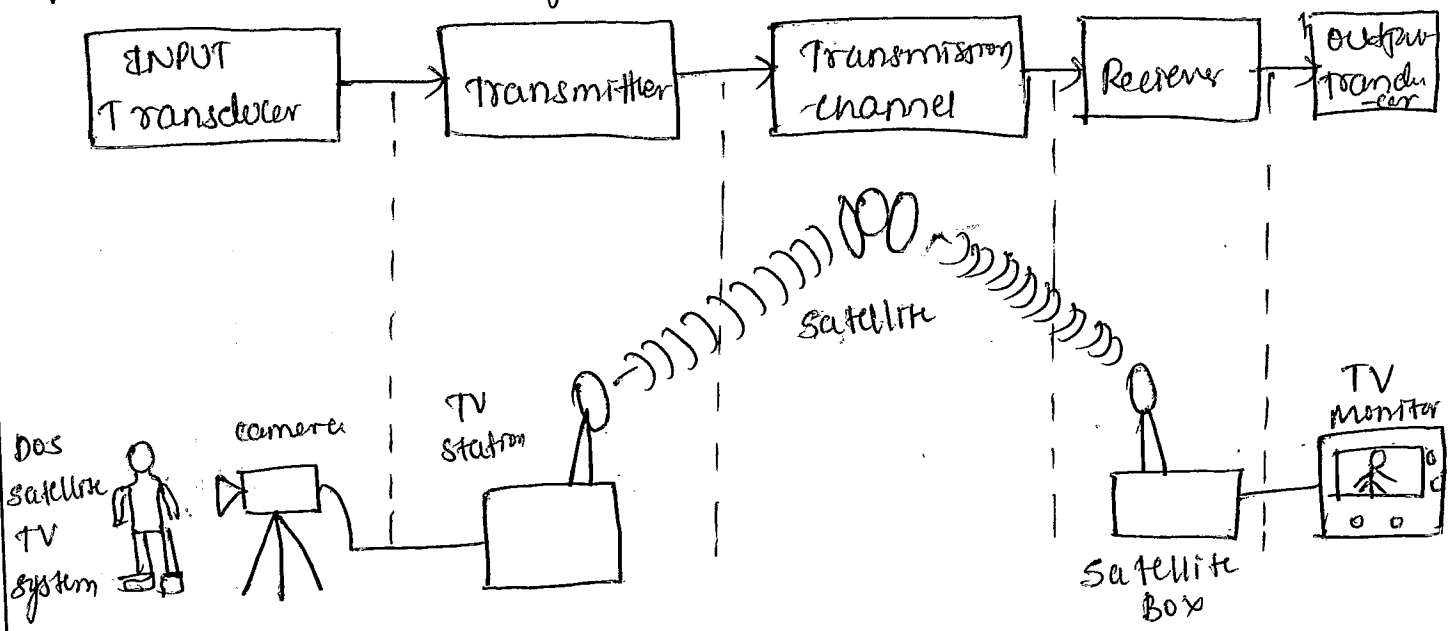
Module - 5

Q9. a. With neat block diagram, explain modern communication System?

8M



Generic Communication System



i) Information Source and Transducer.

Message or information originates in the information source may be in the form of sound picture, words. However, out of these messages only the desired message is selected and communicated.

iii) Transmitter: The base band signal, output from the input transducer is applied to the input of the transmitter. The transmitter performs three operations: filtering, amplification and modulation.

iii) Channel or medium:

The term channel means the medium through which the message travel from the transmitter to the receiver.

iv) Receiver:

The main function of the receiver is to reproduce the original message signal.

v) Destination: Destination is the final stage which is used to convert an electrical message signal into its original form.

b. write a note on Hard wired channel and Soft wired channel. 6M

a) Hardwired channel:-

Transmission lines: It is a conductive medium consisting of two or more conductors through which electrical signal are transmitted from transmitting point to receiver pt.

Ex: Twisted pair cables used in telephony, in which two conductors are twisted together for the purpose of improving electromagnetic compatibility.

~~waveguide~~:- consisting of a hollow, metal tube of uniform cross high-frequency electrical signals with low losses.

waveguide: consisting of a hollow, metal tube of uniform cross-section used for transmitting electromagnetic waves.

optical fibre: consist of very thin hollow glass fibre through which signal is transmitted in the form of light energy.

by soft-wired channel

Natural resources which can be used as the transmission medium for signals.

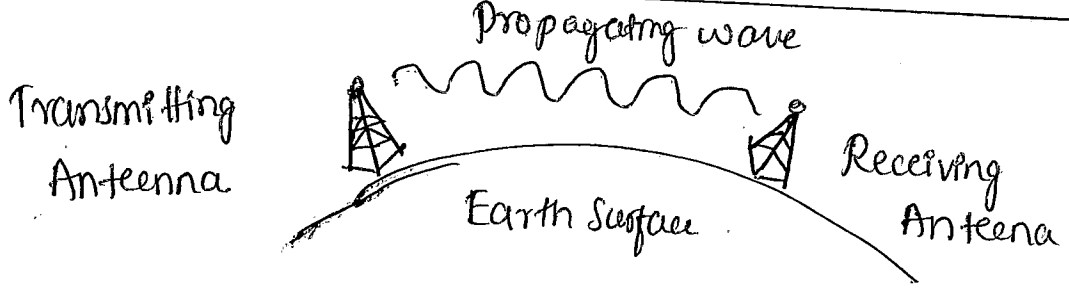
Ex: Air or open space and sea water.

c. Explain with a neat diagram the concept of Radio wave propagation and its different types. [6M]

→ ⊬ Radio wave exhibit the properties of light with the velocity 3×10^8 m/s. These are electromagnetic (EM) wave that consist of electric and magnetic field components, traversed perpendicular to one another in nature.

⊬ Ground or surface wave.

Ground waves can be used for radio communication. Ground wave transmission is very reliable irrespective of the atmospheric conditions.



Frequency range : 30 KHz to 3 MHz

Transmission distance : 100 to 1000 Km

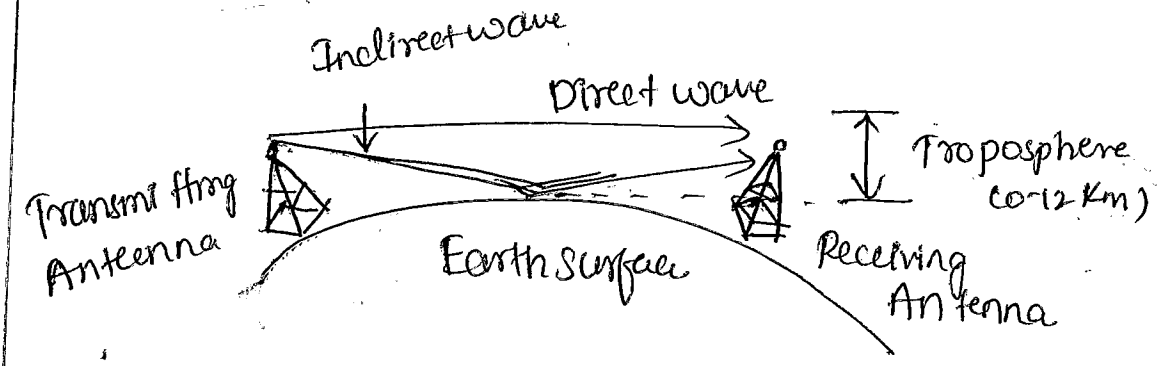
Example : AM radio.

iii) Space or tropo-spheric wave.

In space wave, radio wave move in the earth's troposphere within about 12 KM over the surface of the earth.

Frequency range: 3 MHz to 30 MHz

Example : TV, Transmission.

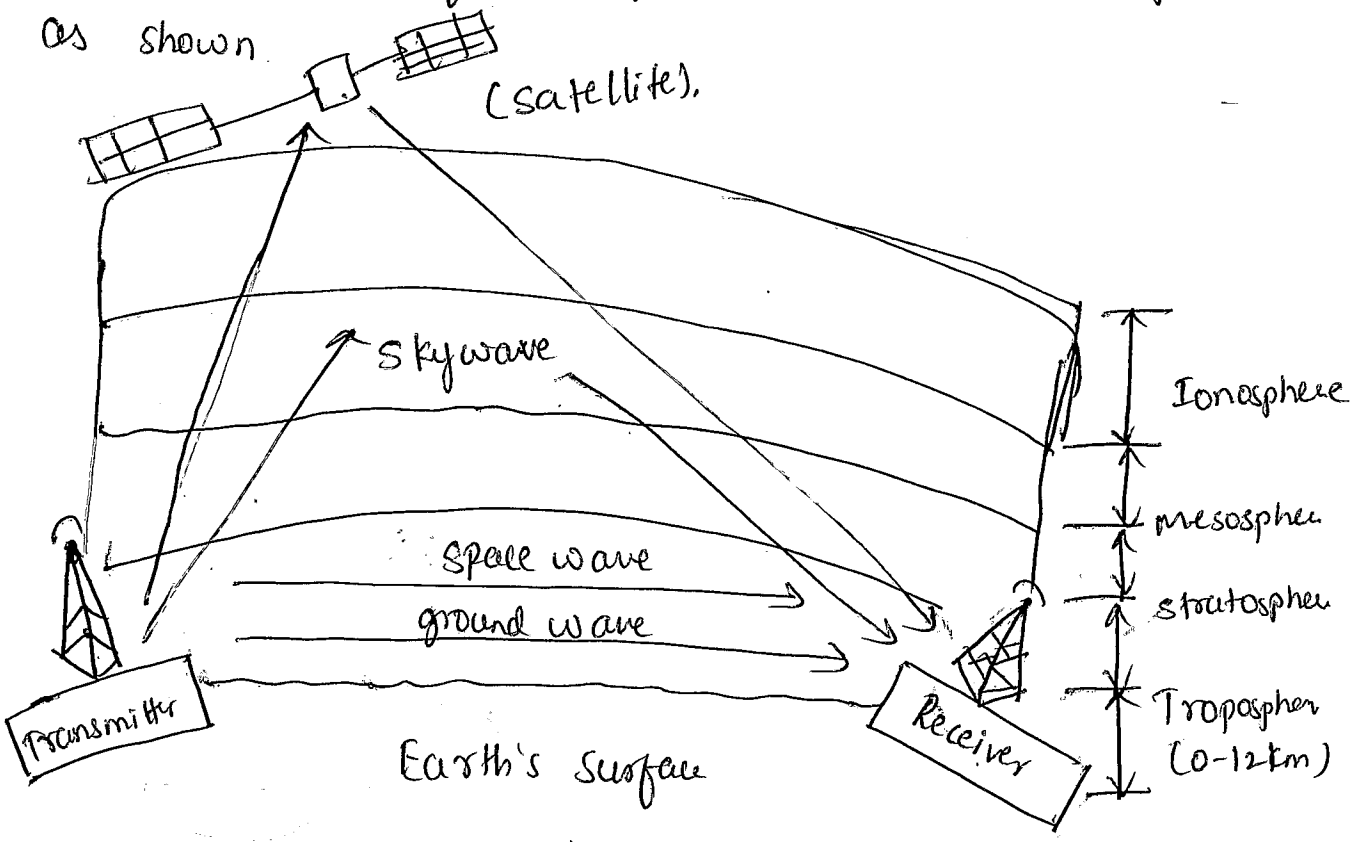


The space wave is made up of two components:

a) a direct or line-of-sight wave from the transmitting antenna to the receiving antenna and

iii) Sky wave:

Radio wave transmitted from the transmitting antenna to the receiving antenna after reflection from the ionosphere as shown



Sky wave is responsible for short wave transmission around the globe via successive reflections at the ionosphere and the earth's surface.

Advantages of sky wave propagation.

1. It supports large distance propagation
2. The frequency range of operation is considerably high.
3. Attenuation due to atmospheric conditions.

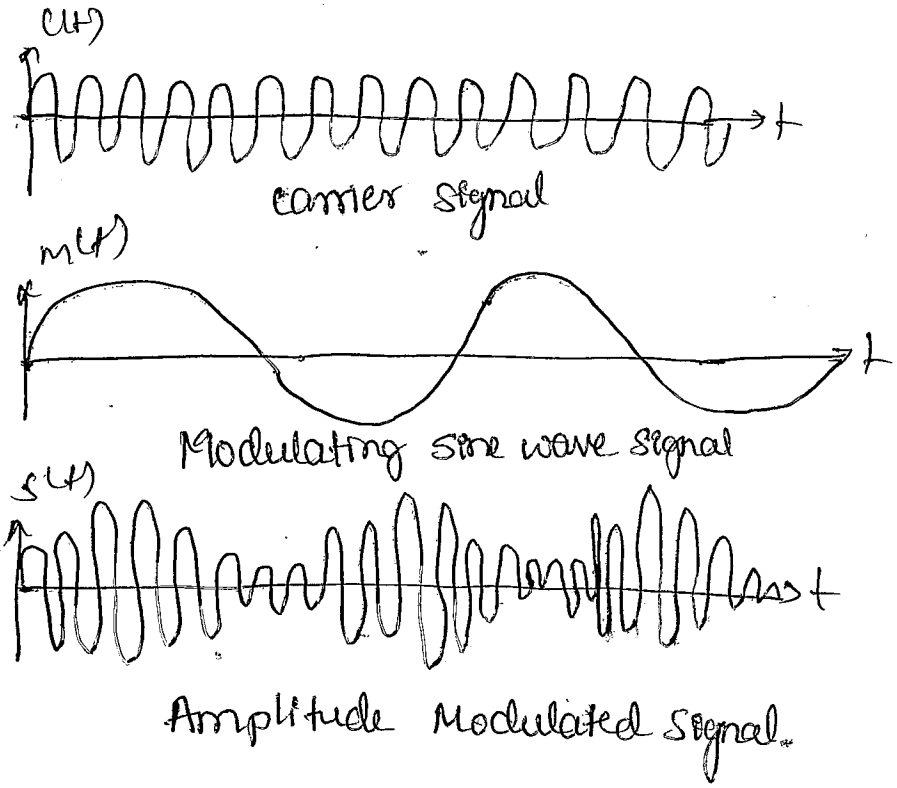
Disadvantage of sky wave

- long-distance propagation requires large-sized antenna

(OR)

10. a. Explain Amplitude Modulation (AM) and Frequency Modulation (FM) with neat waveforms. 8M

→ Amplitude Modulation (AM) : is the process in which the Amplitude of the carrier signal is varied according to the instantaneous value of the message signal, where as the frequency and phase are kept constant. It is as shown in the below figure



The first figure is the carrier wave, which is a high frequency signal and contains no information. Denoted as

$$c(t) = A_c \cos(2\pi f_c t)$$

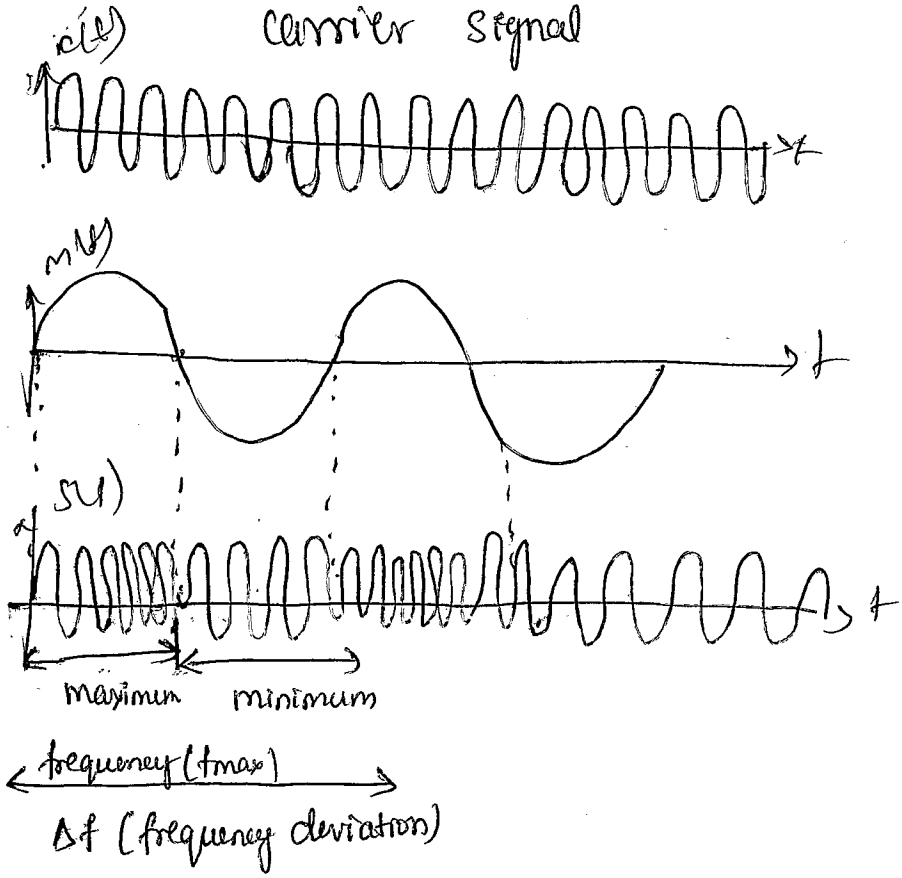
The next one is the modulating wave. which is the message signal, contains information. Denoted as

$$m(t) = A_m \cos(2\pi f_m t).$$

The last one is the resultant amplitude modulated wave.
Mathematically, AM is denoted as

$$V_{AM} = V_c \sin\omega_c t + \frac{ma V_c}{2} \cos(\omega_c - \omega_m)t - \frac{ma V_c}{2} \cos(\omega_c + \omega_m)$$

Frequency Modulation: is defined as a process in which the frequency of the carrier is varied in accordance with the instantaneous value of the message signal, where as the amplitude and phase are kept constant.



Mathematically, FM wave is denoted as

$$s(t) = A \sin[2\pi f_c t + m_f \sin(2\pi f_m t)]$$

Modulation index $m_f = \frac{\Delta f}{f_m}$

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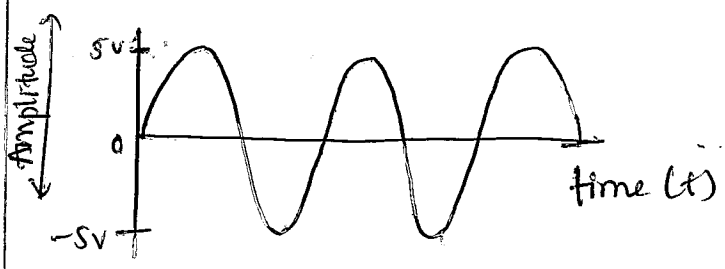
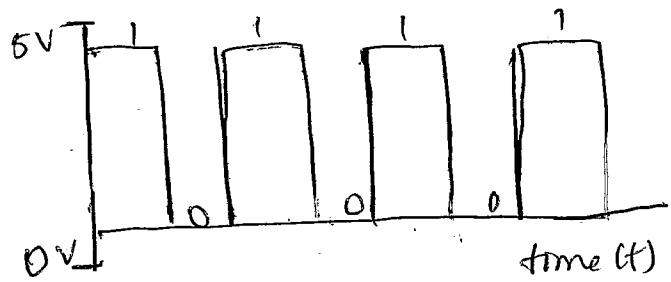
b. List out the advantages of Digital communication over Analog communication. 6M

Analog Signals	Digital Signals
	
* Analog Signal is continuous and time varying	* Digital signal have two or more states
* Trouble Shooting is difficult	* Trouble Shooting is easy
* Easily affected by the noise	* These are stable and less prone to noise
* Analog signals use continuous value to represent the data usually in the form of Sine wave	* Digital signal use discrete value to represent data
* Analog Signal may be corrupted during data transmission	* Accuracy is immune from the noise
* Analog signals use more power	* Digital signal are not corrupt during data transmission
Ex: Temperature, Pressure	* Digital signal use less power
	Ex: Motor start, Trip.

C. Explain different multiple Access Techniques. [6M]

→ Multiple access is a technique to provide communication service to multiple users over a signal channel. It allows multiple mobile user share the allotted spectrum in the most effective manner.

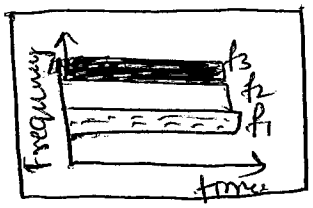
Frequency Division Multiple Access (FDMA).

Available frequency band is split into smaller frequency channels, and different channels are assigned to different user.

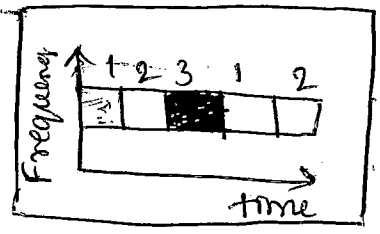
Time Division Multiple Access (TDMA).

Various user can transmit at the same frequency band at different times. Every user is permitted to transmit only in specific time slot using a common frequency band.

FDMA



TDMA



code Division Multiple Access (CDMA).

Mobile receive signals on the same carrier frequency and at the same time. But the signals are labelled by the use of codes.

Rohit. CM

CDMA