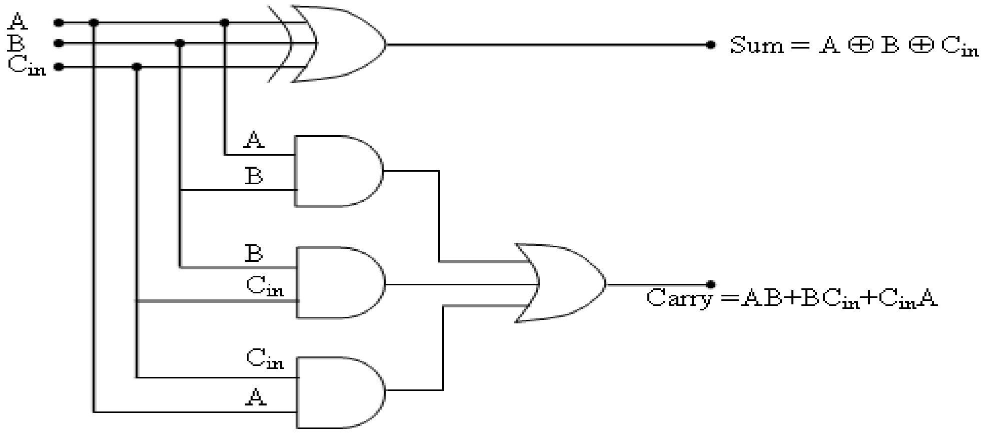
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD
II PUC EXAMINATION 1 - MARCH 2025

SUBJECT: 40- ELECTRONICS **Scheme of Evaluation** **MAX. MARKS: 70**

Qn. No.	Answer	Marks
	PART – A 15 × 1 = 15	
01.	b) FET	1
02.	a) Quiescent point	1
03.	b) 180^0	1
04.	b) Decreases	1
05.	d) Slew rate	1
06.	b) Op-amp	1
07.	d) Crystal oscillator	1
08.	a) F layer	1
09.	b) 455 kHz	1
10.	d Thyristor	1
11.	c) 0101 1001	1
12.	c) $Q = 1$, $\overline{Q} = 0$	1
13.	b) 2	1
14.	d) !=	1
15.	c) Code Division Multiple Access	1
	5 × 1 = 5	
16.	f) highest	1
17.	d) comparator	1
18.	b) damped	1
19.	c) twice	1
20.	a) combinational	1
	PART – B 5 × 2 = 10	
21.	a. Fixed bias (base bias) b. Collector to base feedback bias c. Emitter feedback bias d. Voltage divider bias (universal bias) (Any two)	2
22.	**Given:** BW = 1 MHz, A = 100, β = 0.01 $BW_f = BW(1 + A\beta)$ $= 1\ MHz\,(1 + 100 \times 0.01) = 2\ MHz$	 1 1
23.	**Given:** L = 10 μH, C_{eq} = 1 nF $f = \frac{1}{2\pi\sqrt{LC_{eq}}}$ $f = \frac{1}{2 \times 3.142\sqrt{10\times10^{-6}\times1\times10^{-9}}} = \frac{1}{2\times3.142\times10^{-7}} = 1.59\ MHz$	 1 1
24.	$P_T = P_C(1 + \frac{m_a^2}{2})$ Upper limit of $m_a = 1$	1 1
25.	1. AC to DC - Rectifier 2. AC to AC - AC voltage controller 3. DC to DC – Chopper 4. DC to AC – Inverter Each ½ mark	2

26.



2

27.

ROM (Read Only Memory): These memory circuits permanently store binary numbers. ROM memory cell contents are not being changed by the CPU, but they may be used by CPU. ROM is also called non-volatile, because its content does not lost when power is removed. 1

RAM (Random Access Memory): These memory circuits temporarily store binary numbers. RAM memory cell contents are both read and written to by the CPU. RAM is also called volatile memory, because its contents are lost when power is removed. 1

28.

Wifi is a universal wireless networking technology that utilizes radio frequency to transfer data. Wifi allows high speed internet connections without the use of cables. The term wifi is a construction of "wireless fidelity" and commonly used to refer to wireless networking technology. 2

(or any two points)

PART – C

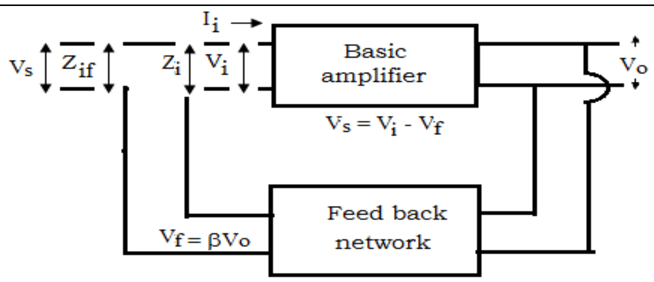
5 × 3 = 15

29.

	FET	BJT
1	Unipolar device	Bipolar device
2	Current conduction is by one type of charge carriers – either electrons or holes	Current conduction is by 2 types of charge carriers - electrons and holes
3	Voltage controlled device	Current controlled device
4	Input resistance is very high	Input resistance is low
5	High switching speed	Low switching speed
6	Less noisy	More noisy

(Any three differences) 3

30.



1

Consider a voltage series feedback amplifier in which, the input impedance Z_i of the basic amplifier without feedback is given by,

$$Z_i = \frac{v_i}{i_i} \qquad \cdots (1)$$

[Where v_i is the input voltage to the internal amplifier and i_i is the input current].

With negative feedback, the input impedance is given by,

$$Z_{if} = \frac{v_s}{i_i} \qquad \cdots \ (2)$$

Output voltage of an amplifier is given by,

$$v_0 = Av_i \qquad \cdots \ (3)$$

We know that for negative feedback amplifier, the net input v_i to the internal amplifier is

$$v_i = v_s - v_f$$

$$\text{i.e., } v_s = v_i + v_f$$

$$\text{i.e., } v_s = v_i + \beta v_0 \quad [v_f = \beta v_0]$$

2

Substituting equation (3) in the above equation we get,

$$v_s = v_i + \beta A v_i$$

$$\text{i.e., } v_s = v_i\,(1 + A\beta).$$

Substituting in equation (2) we get

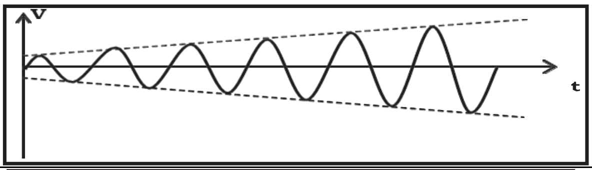
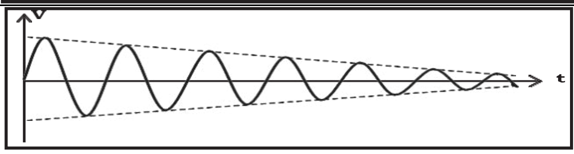
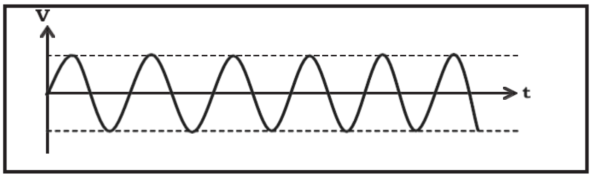
$$Z_{if} = \frac{v_i\,(1 + A\beta)}{i_i} \qquad \cdots \ (4)$$

From equation (1) and (4),

$$Z_{if} = Z_i\,(1 + A\beta).$$

Block diagram -1 mark
Derivation - 2 mark

31.

		Marks
a) $A\beta > 1$		1
b) $A\beta < 1$		1
c) $A\beta = 1$		1

32. **Noise Signal:** Any unwanted electrical disturbance added to the signal in the communication channel. 1

The maximum distance visible to the naked eye on the surface of the Earth is called **optical horizon (OH).** Due to the curvature of the Earth, the sky and the Earth appears to meet at a far distance and this is called **optical horizon.** However the radio waves can travel far beyond the optical horizon and it is called the **radio horizon** (**RH**). The radio horizon is about $\frac{4}{3}^{rd}$ the optical horizon. For the earth's dimensions, the radio horizon is usually less than 100 km. 2

33.

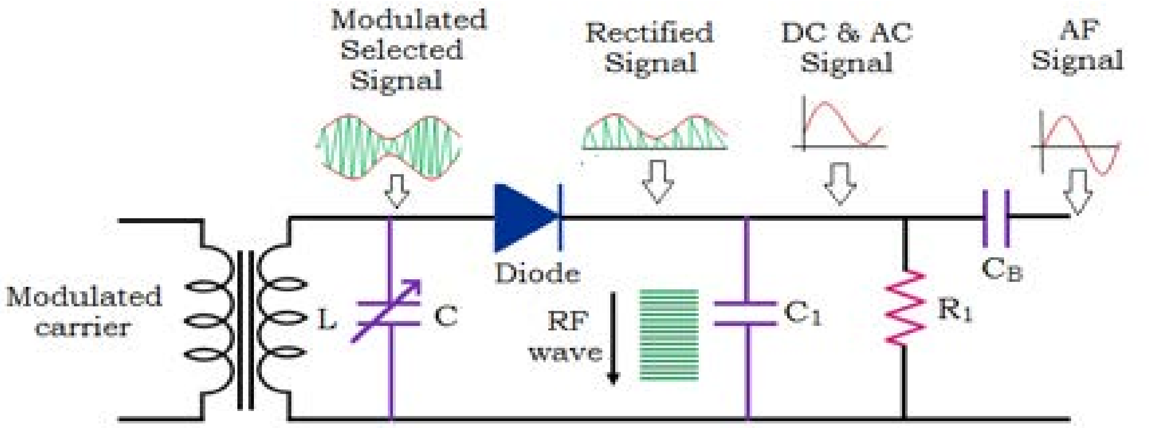


Diagram – 2 mark
Waveforms – 1 mark

Marks: 3

34.

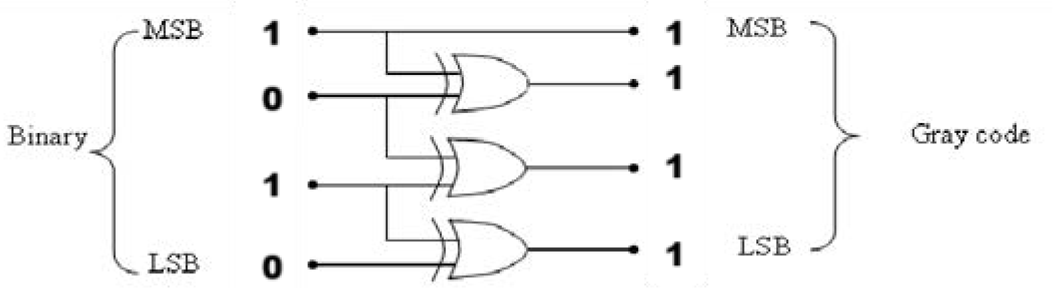
Given: HWR $\alpha = 60^0$, $V_{rms} = 230$ V, $V_m = V_{rms} \times \sqrt{2} = 325$ V, R = 20 Ω

$$V_{dc} = \frac{V_m}{2\pi}[1 + cos\alpha]$$ 1

$$\therefore \quad V_{dc} = \frac{V_m}{2\pi}[1 + 0.5] = 77.5 \text{ V}$$ 1

$$I_{dc} = \frac{V_{dc}}{R} = 3.87 \text{ A}$$ 1

35.



Marks: 2

$(1010)_2 = (1111)_{Gray}$ 1

36.

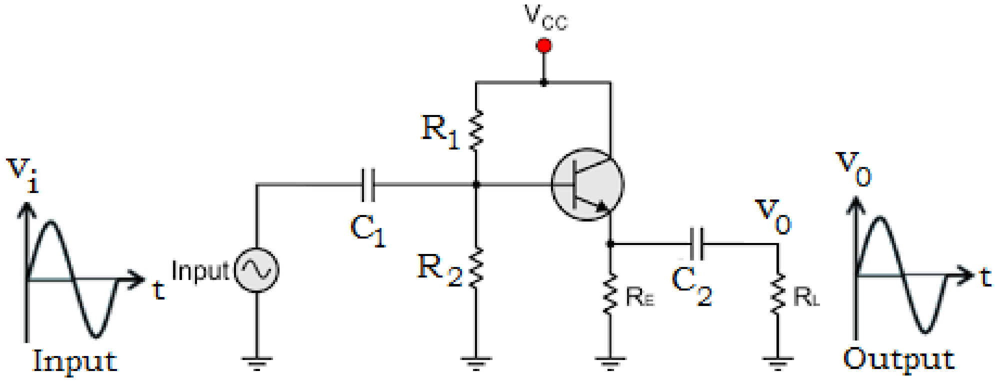
1. To provide LAN connection.
2. Long distance telephone and cable TV systems.
3. Secure communication system at military bases.
4. Short range transmission of health sensor data from medical device to the computer.
5. Closed circuit TV system.
6. Internet connection.

(or any three) 3

PART – D (Section I) $3 \times 5 = 15$

37.

V_{CC}, R_1, R_2 and R_E provide the necessary DC bias to the transistor.
C_1 and C_2 are called the coupling capacitors whose function is to block the DC and allow ac signals.



3

Working: 1

During positive half cycle of the input signal,

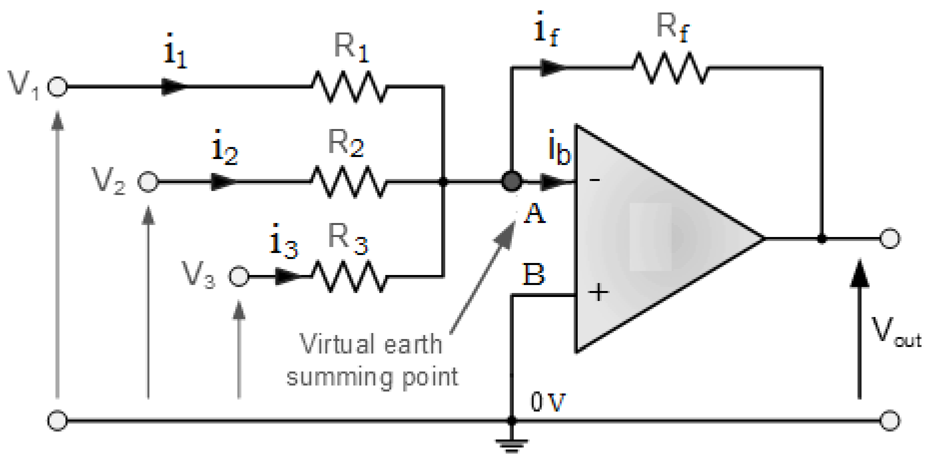
1. The forward bias across EB junction increases hence i_B and i_E increases [because $i_E = (1 + \beta)\, i_B$].
2. Thus voltage drop across R_E (i.e., $i_E R_E$) which is the output voltage increases in the same proportion of the input voltage. 1

During negative half cycle of the input signal,

1. The forward bias across EB junction decreases hence i_B and i_E decreases.
2. Thus voltage drop across R_E (i.e., $i_E R_E$), which is the output voltage, decreases in the same proportion of the input voltage.

Circuit diagram 2 mark
Working 2 mark
Input output waveform 1 mark

38.



2

For an ideal op-amp, open loop gain A = ∞ and $Z_i = \infty$

By virtual ground concept, $V_B = V_A = 0$

Since input impedance $Z_i = \infty \rightarrow i_b = 0$

Applying KCL at A

$$i_i = i_b + i_f$$

$$i_i = i_f \quad \text{(since } i_b = 0)$$

$$i_1 + i_2 + i_3 = i_f$$

$$\frac{V_1 - V_A}{R_1} + \frac{V_2 - V_A}{R_2} + \frac{V_3 - V_A}{R_3} = \frac{V_A - V_0}{R_f}$$

3

As $V_A = 0$,

$$\frac{V_1 - 0}{R_1} + \frac{V_2 - 0}{R_2} + \frac{V_3 - 0}{R_3} = \frac{0 - V_O}{R_f}$$

$$\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} = \frac{-V_O}{R_f}$$

$$V_O = -R_f\left(\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3}\right)$$

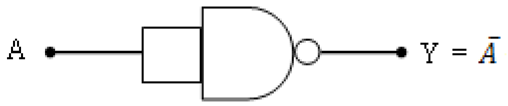
If $R_1 = R_2 = R_3 = R_f = R$,

$V_o = -(V_1 + V_2 + V_3)$

Circuit diagram 2 mark
Derivation 3 mark

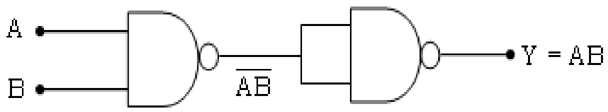
39.

NOT gate using NAND gate:



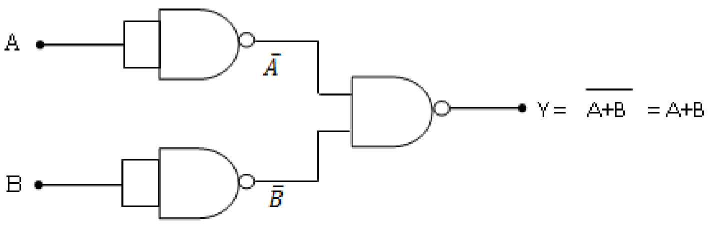
1

AND gate using NAND gates:



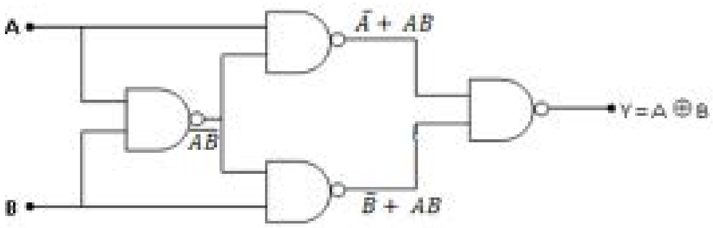
1

OR gate using NAND gates:



1

XOR gate using NAND gates:



2

40.

```
MOV A, #3FH        1
MOV B, #2AH        1
DIV AB             1
```

Quotient is stored in register A — 1

Remainder is stored in register B — 1

41.

```
#include <stdio.h>                                        1
void main()
{                                                         1
   int x,y;
   printf ("Enter the two integer number \n");            1
   scanf ("%d%d", &x,&y);
   if (x==y)
   {
   printf ("The given numbers are equal\n");              1
   }
   else
   {
   printf ("The given numbers are not equal \n");
   }                                                      1
}
```

PART D (Section II) — 2 x 5 = 10

42. **Given:** $\beta = 150$, $R_1 = 45\ k\Omega$, $R_2 = 5\ k\Omega$, $R_E = 470\ \Omega$, $R_C = 2\ k\Omega$, $V_{CC} = 15\ V$, $V_{BE} = 0.7\ V$ and $r_e^1 = \frac{26\ mV}{I_E}$

i) $V_{5k} = V_2$

$V_2 = \frac{V_{cc}}{R1+R2} \times R_2$ — 1

$V_2 = \frac{15}{45k+5k} \times 5\ k$

$V_2 = 1.5\ V$

ii) $I_E = \frac{V_2 - V_{BE}}{R_E}$ — 1

$I_E = \frac{1.5-0.7}{470} = 1.7\ mA$

iii) $r_e^1 = \frac{26\ mV}{I_E} = \frac{26\ mV}{1.7 mA} = 15.29\ \Omega$ — 1

iv) $A_V = \frac{R_C}{r_{e'}} = \frac{2\ k}{15.29} = 130$ — 1

v) $A_i = \beta = 150$ — 1

43.

(a) Inverting amplifier

$V_{01} = -\left(\frac{R_{f1}}{R_{i1}}\right) \times V_{i1}$ — 1

$= -\left(\frac{10\ k}{4.7\ k}\right) \times 1 = -2.12\ V$ — 1

(b) Non inverting amplifier — 1

$V_{02} = \left(1 + \frac{R_{f2}}{R_{i2}}\right) \times V_{i2}$

$= \left(1 + \frac{20\ k}{8.2\ k}\right) \times 2$ — 1

$= 6.87\ V$ — 1

44.

(a) **Given:** $v_m = 30\sin(2\pi \times 10^3 t)$ and $v_c = 60\sin(2\pi \times 10^5 t)$

Standard Equations are $v_m = V_m\sin(\omega_m t)$ and $v_c = V_c\sin(\omega_m t)$

$\therefore$ $V_m = 30$ V and $V_c = 60$ V

Modulation index $m_a = \frac{V_m}{V_C} = \frac{30}{60} = 0.5$ — 1

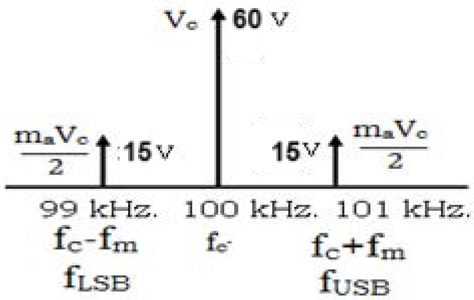
Amplitude of each sideband $= \frac{m_a V_c}{2} = \frac{0.5\times60}{2} = 15$ V — 1

$$f_m = \frac{\omega_m}{2\pi} = \frac{2\pi\times10^3}{2\pi} = 1 \text{ kHz.}$$

$$f_c = \frac{\omega_c}{2\pi} = \frac{2\pi\times10^5}{2\pi} = 100 \text{ kHz.}$$

Lower sideband frequency $= f_{LSB} = f_c - f_m = (100-1)$ kHz $= 99$ kHz

Upper sideband frequency $= f_{USB} = f_c + f_m = (100+1)$ kHz $= 101$ kHz — 1



— 1

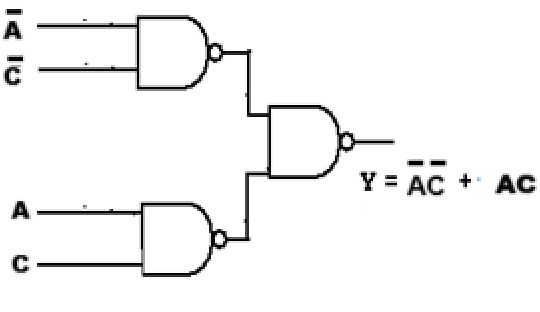
(b) Bandwidth $= 2f_m = 2 \times 1$ kHz $= 2$ kHz. — 1

45.

AB \ CD	$\bar C\bar D$	$\bar C D$	CD	$C\bar D$
$\bar A\bar B$	x	1	0	0
$\bar A B$	1	1	0	0
AB	0	0	x	1
$A\bar B$	0	0	1	x

— 2

$Y = \overline{A}\overline{C} + AC$ — 1



— 2

Drawing K-map and grouping – 2 mark
Writing simplified expression – 1 mark
Drawing logic circuit – 2 mark

*****