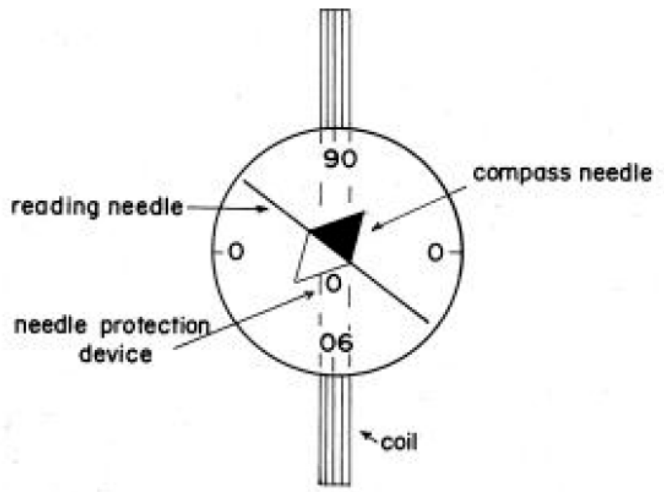
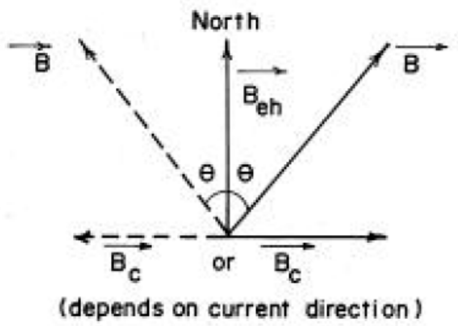
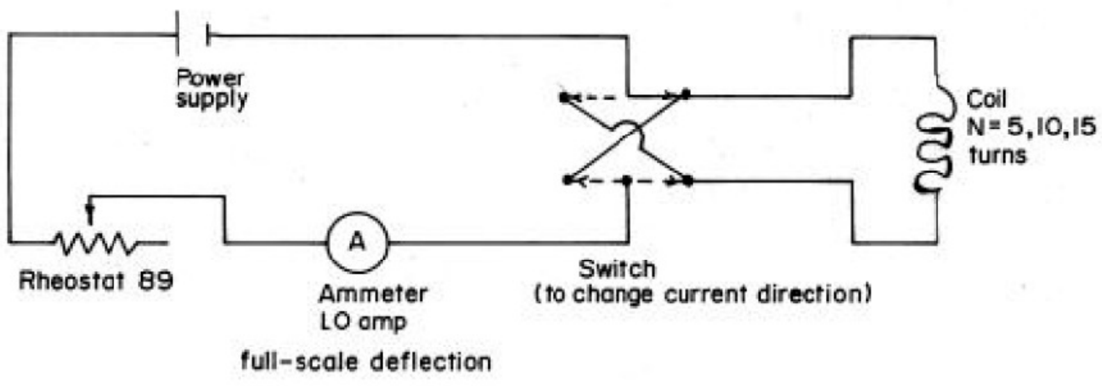
1. Tangent galvanometer is a:

Ans: Secondary device

The earth exhibits a weak magnetic field at a given point on the earth's surface. This field has a horizontal component (parallel to the earth) and a vertical component (perpendicular to the earth). We will use an obsolete instrument, the tangent galvanometer , to measure the horizontal component of the field. We will then use a dip needle to measure the angle the total field makes with the horizontal. Knowledge of these two pieces of information will allow us to find the magnitude of the total field.







From the Biot-Savart law, the magnetic field at the center of the coil due only to the current I is given by:

$$B_c = \frac{\mu_o NI}{2R} \quad \textbf{Eq. 1}$$

where: μ_0 is the permeability of free space
N is the number of turns of wire
I is the current in the wires
R is the mean radius of the coils.

Note that this field vector is perpendicular to the plane of the coil.

If the coils of the galvanometer are oriented so that the Earth's magnetic field (B_e) is parallel to the plane of the coils, and the magnetic field due to the current (B_e) is perpendicular to the coils (as shown below) the net field B is the vector sum of the two.

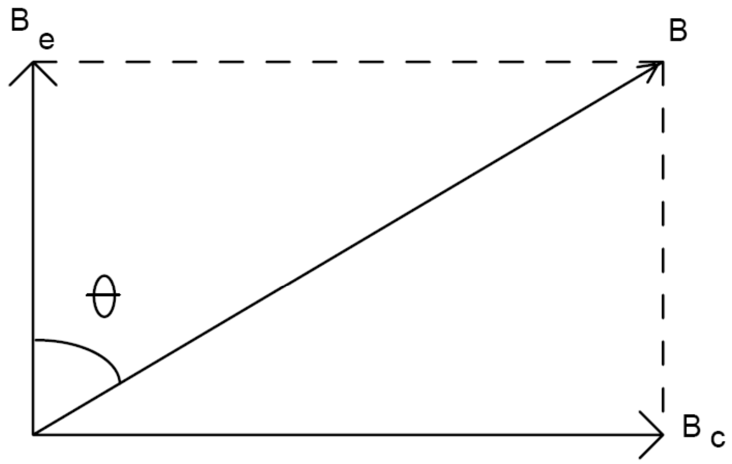


Figure l. The net magnetic field B

From Figure 1, it can be seen that the horizontal component of the earth's magnetic field B_e can be expressed as

$$\tan\theta = \frac{B_c}{B_e} \quad \textbf{Eq. 2}$$

Where θ is the compass reading. Note that Eq. 2 can be rearranged to allow a linear relationship between B_c and $\tan\theta$

$$\frac{\mu_o NI}{2R} = B_e \tan\theta \quad \textbf{Eq. 3}$$

The horizontal component of the earth's field can now be found by measuring the field due to the coils and the direction of the net magnetic field relative to the direction of the earth's field.

2. Canonical form of π (0, 3, 6, 7) is:

Ans:∑(1,2,4,5)

The numbers which are not in π terms. π is called Max term and ∑ is called min term

3. The VSWR in terms of voltage is given by:

$$VSWR = \frac{E_{max}}{E_{min}} = \frac{E_i + E_r}{E_i - E_r}$$

Where E_{max} = maximum measured voltage
E_{min} = minimum measured voltage
E_i = incident wave amplitude, volts
E_r = reflected wave amplitude, volts

$$VSWR = \frac{1 + \sqrt{\frac{P_{rev}}{P_{fwd}}}}{1 - \sqrt{\frac{P_{rev}}{P_{fwd}}}}$$

Where P_{rev} = reverse power
P_{fwd} = forward power

VSWR can also be represented other ways, such as Return Loss, Mismatch Loss and Reflection Coefficient. Reflection Coefficient is common, can be calculated several ways, and ultimately used to calculate VSWR. Here are some formulae for determining Reflection Coefficient (Ψ):

$\rho = \frac{E_r}{E_i}$ Where Er = reflected voltage, Ei = incident voltage

$\rho = \left|\frac{Z_1 - Z_2}{Z_1 + Z_2}\right|$ Where Z1 and Z2 are the mismatched impedances in ohms

$\rho = \sqrt{\frac{P_{ref}}{P_{fwd}}}$ Where P_{ref} = reverse power, P_{fwd} = forward power

Once the reflection coefficient has been calculated, it can be used to determine VSWR by the following formula:

$$VSWR = \frac{1+\rho}{1-\rho}$$

Another way to describe the affect of VSWR is Return Loss. Return Loss is the measure in dB of the ratio of forward and reverse power. If the return loss is 10dB, then 1/10 of the forward power is reflected back. Return Loss can be calculated by the following formulae:

$$\text{Ret Loss} = 10\log\left[\frac{P_{fwd}}{P_{rev}}\right] = -20\log\left[\frac{E_r}{E_i}\right] = -20\log\left[\frac{VSWR - 1}{VSWR + 1}\right] = -20\log\rho$$

Yet another way to reference reflected power is Mismatch Loss (or Transmission Loss). This is a dB ratio between the incident power and the power actually absorbed by the termination. Following are formulae for computing Mismatch Loss:

$$\text{Mismatch Loss} = -10\log(1-\rho^2) = 10\log\left(\frac{P_{fwd}}{P_{fwd} - P_{rev}}\right)$$

4. Population inversion of semiconductor diode is achieved by:

Ans:**Pumping**

In physics, specifically statistical mechanics, a **population inversion** occurs when a system (such as a group of atoms or molecules) exists in a state with more members in an excited state than in lower energy states. The concept is of fundamental importance in laser science because the production of a population inversion is a necessary step in the workings of a standard laser.

To understand the concept of a population inversion, it is necessary to understand some thermodynamics and the way that light interacts with matter. To do so, it is useful to consider a very simple assembly of atoms forming a laser medium.

Assume there are a group of N atoms, each of which is capable of being in one of two energy states, either

1. The *ground state*, with energy E_1; or
2. The *excited state*, with energy E_2, with $E_2 > E_1$.

The number of these atoms which are in the ground state is given by N_1, and the number in the excited state N_2. Since there are N atoms in total,

$$N_1 + N_2 = N$$

The energy difference between the two states, given by

$$\Delta E_{12} = E_2 - E_1,$$

determines the characteristic frequency ν_{12} of light which will interact with the atoms; This is given by the relation

$$E_2 - E_1 = \Delta E = h\nu_{12},$$

h being Planck's constant.

If the group of atoms is in thermal equilibrium, it can be shown from thermodynamics that the ratio of the number of atoms in each state is given by a Boltzmann distribution:

$$\frac{N_2}{N_1} = \exp\frac{-(E_2 - E_1)}{kT},$$

where T is the thermodynamic temperature of the group of atoms, and k is Boltzmann's constant.

We may calculate the ratio of the populations of the two states at room temperature ($T \approx 300$ K) for an energy difference ΔE that corresponds to light of a frequency corresponding to visible light ($\nu \approx 5\times10^{14}$ Hz). In this case $\Delta E = E_2 - E_1 \approx 2.07$ eV, and $kT \approx 0.026$ eV. Since $E_2 - E_1 \gg kT$, it follows that the argument of the exponential in the equation above is a large negative number,

Absorption [edit]

Main article: Absorption (optics)

If light (photons) of frequency ν_{12} pass through the group of atoms, there is a possibility of the light being absorbed by atoms which are in the ground state, which will cause them to be excited to the higher energy state. The probability of absorption is proportional to the radiation intensity of the light, and also to the number of atoms currently in the ground state, N_1.

Spontaneous emission [edit]

Main article: Spontaneous emission

If a collection of atoms are in the excited state, spontaneous decay events to the ground state will occur at a rate proportional to N_2, the number of atoms in the excited state. The energy difference between the two states ΔE_{21} is emitted from the atom as a photon of frequency ν_{21} as given by the frequency-energy relation above.

The photons are emitted stochastically, and there is no fixed phase relationship between photons emitted from a group of excited atoms; in other words, spontaneous emission is incoherent. In the absence of other processes, the number of atoms in the excited state at time *t*, is given by

$$N_2(t) = N_2(0) \exp \frac{-t}{\tau_{21}},$$

Stimulated emission [edit]

Main article: Stimulated emission

If an atom is already in the excited state, it may be perturbed by the passage of a photon that has a frequency ν_{21} corresponding to the energy gap ΔE of the excited state to ground state transition. In this case, the excited atom relaxes to the ground state, and is induced to produce a second photon of frequency ν_{21}. The original photon is not absorbed by the atom, and so the result is two photons of the same frequency. This process is known as *stimulated emission.*

Note: Direct band gap semiconductors are used for LASERs

4. A waveguide operation attenuates below cut-off is:

Ans: **Reflection**

but the angles of reflection are equal to each other in a waveguide. The CUTOFF FREQUENCY in a waveguide is a frequency that would cause angles of incidence and reflection to be perpendicular to the walls of the guide. At any frequency below the cutoff frequency, the wavefronts will be reflected back and forth across the guide (setting up standing waves) and no energy will be conducted down the waveguide.

5. Quantization noise occurs in:

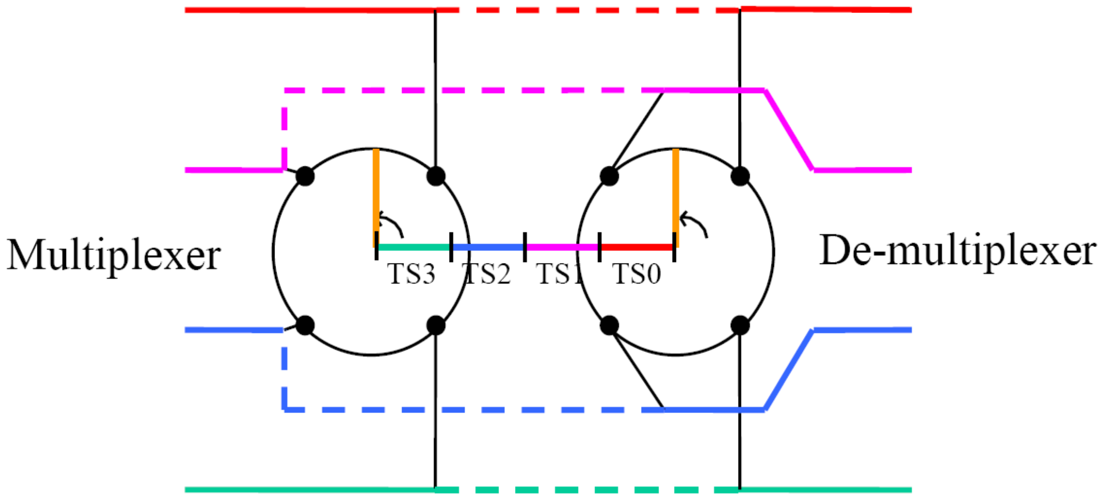
Ans:**PAM**

Quantization error is more when quantization is done for a fixed analog voltage where more ambiguity occurs.

7. In TDM which slot is being proportional to transmission:

Ans: Time slot (Frequency is constant and Time slots are allowed for each user)

- Each rotation corresponds to a frame on the multiplex



8. In TV sound is __________ modulation and Picture is ____________ modulation , Total signal is transmitted as ___________ .

Ans: **FM, AM, VSB Modulation**

9. In 8085 stack pointer is __________ bit register.

Ans: **16 bit** because function of Stack pointer is to point the next stack memory location.

10. MOV A,B which is the type of Addressing

Ans: **Register Addressing**

11. In a modulation IF frequency is 455 KHz and carrier frequency is 1000 KHz then find Modulating frequency.

Ans: **545 KHz**

In this case $f_c = f_{osc}$ and $f_m = f_{signal}$

$IF = f_{osc} - f_{signal}$ so $f_{signal} = f_m = f_c - IF$ = 1000 KHz – 455 KHz = 545KHz

12. Is 'h' parameter is directly applicable in transformer's primary winding?

13. Which is the large gain directive antenna among given?

Ans: Parabolic Antenna is the antenna having higher gain and directivity

14. Doppler frequency for radar is given by?

Ans:

The Doppler effect (or Doppler shift as it is sometimes referred to) can be described mathematically in the case of the Doppler radar by Eq. 7.1.

$$f_d = \frac{2u}{\lambda_t}\cos(\theta) \qquad (7.1)$$

where f_d is the change in frequency (Doppler frequency), u is the velocity of the relative motion, λ_t is the wavelength of the transmitted waves, and θ is the angle between the source and the direction of motion.

15. 1msec pulse can be stretched to 1 sec pulse by using

Ans: **Mono stable Multivibrator**

16. Phenomena of microwave signals following the curvature of earth is?

Ans: **Diffraction**

17. To couple coaxial line to parallel line it is best to use a

Ans:**Balun**

A **balun** is an electrical device thatconverts between a balanced signal (two signals working against each other where ground isirrelevant) and an unbalanced signal (a single signal working against ground or pseudo-ground). A balun can take many forms and may include devices that also transform impedances but neednot do so. Transformer baluns can also be used to connect lines of differing impedance. The originof the word balun is **bal**(ance) + **un**(balance). Baluns can take many forms and their presence is not always obvious. Sometimes, in the case of transformer baluns, they use magnetic coupling but need not do so. Common-mode chokes are also used as baluns and work by eliminating, rather than ignoring, common mode signals.

Pair of AC&E 120 Ω twisted pair (Krone IDC) to 75 Ω coaxial cable balun transformers. Actual length is about 3cm.

18. If Image frequency is 2110 KHz and Signal frequency is 200 KHZ then IF stage frequency is?

Ans: $f_{image} = f_s + 2f_i$ f_i = 2110-200/2 = 955 KHz

19. No.of address line for 8K byte memory is?

Ans:**14 address lines**

8 KB = 8 x 1024 = 2^3 x 2^{10} = 2^{13} that is 14 address bits are required

If the single memory chip can not be specified the required memory capacity then the designer should do the followings.

(1) Find out the no of single chip required to full fill the total capacity by

$$\text{No of chip} = \frac{\text{Required capacity}}{\text{Available capacity}}$$

(2) There are two type of expression
(i) Increasing memory location or words
(ii) Increasing word size, i.e. no of bits in each word.
(3) In case (i) the number will be of same as the address lines of available chip. The difference of the address lines of the capacity 7 availability will give the size of the decoder and the output of the decoder will decode among the chips.
In case (ii) address line data lines will be common to all chips because all chips at the same location collectively make a single word.

20. For TV reception antenna commonly used is ?

Ans: Yagi-Udan Antenna (Recent Parabolic Antenna)

21. Which of the following is a non-vector interrupt

a) RST 5.5 b)RST 6.5 c)RST 7.5 d)INTR

Ans: **INTR**

Interrupt name	Maskable	Vectored
INTR	Yes	No
RST 5.5	Yes	Yes
RST 6.5	Yes	Yes
RST 7.5	Yes	Yes
TRAP	No	Yes

22. In 2's complement representation a certain –ve number is -N is 1011 , The representation for +N is:

Ans: Number is +N = 0100 MSB show signed bit other bits are complemented to give +N from –N

Table 2.7 Examples of eight-bit 2's and 1's complement representations (MSB = sign bit)

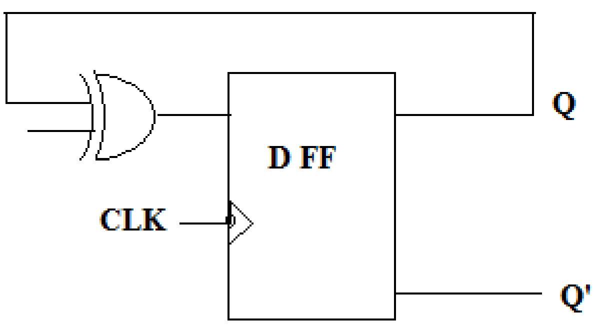
Decimal Value	2's Complement	1's Complement
−128	10000000	
−127	10000001	10000000
−31	11100001	11100000
−16	11110000	11101111
−15	11110001	11110000
−3	11111101	11111100
−0	00000000	11111111
+0	00000000	00000000
+3	00000011	00000011
+15	00001111	00001111
+16	00010000	00010000
+31	00011111	00011111
+127	01111111	01111111
+128		

23. Find out the correct from the following

a)A+1 =A b)A+1=0 c)A+1=A' d)A+A=A

Ans: **d)**

24. Identify the circuit?



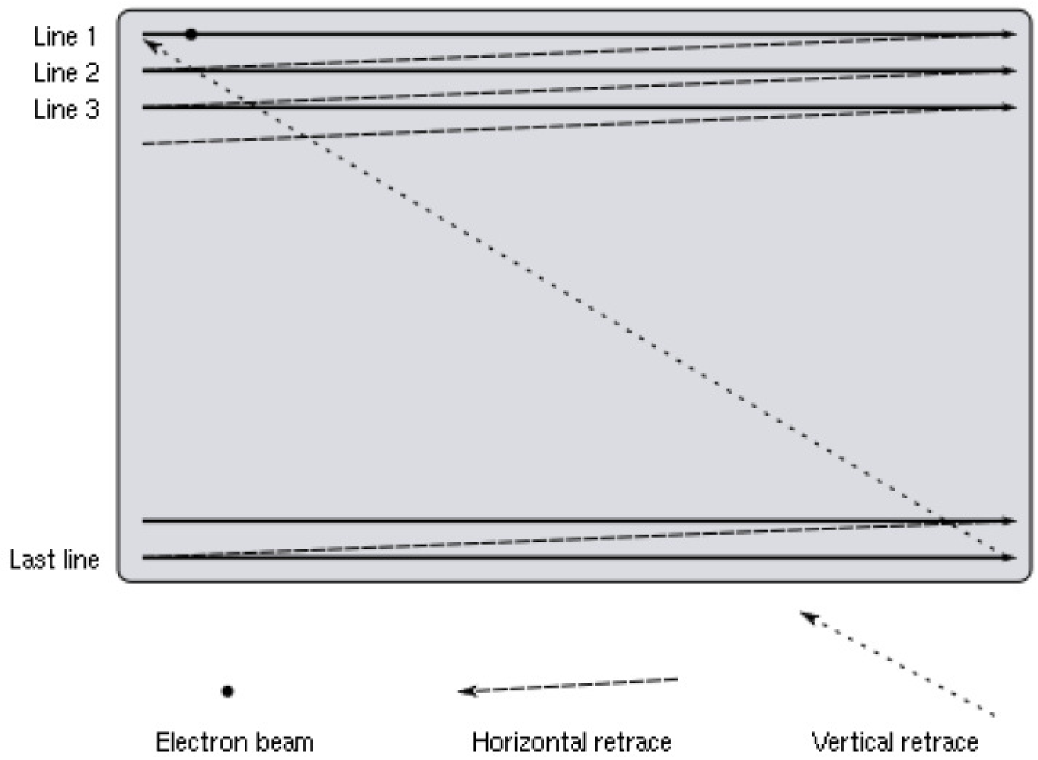
Ans: 1 bit Ring counter

25. The output of a envelop detector is?

Ans: Sine Wave

26. Equalising pulse in TV send during

a) L blanking **b)V blanking** c) H retrace d) L retrace



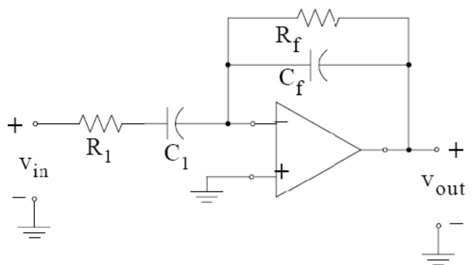
A cathode-ray tube (CRT) television displays an image by scanning a beam of electrons across the screen in a pattern of horizontal lines known as a raster. At the end of each line the beam returns to the start of the next line; at the end of the last line it returns to the top of the screen. As it passes each point the intensity of the beam is varied, varying the luminance of that point. A color television system is identical except that an additional signal known as chrominance controls the color of the spot.

27. In TV scanning is from

a)Top to Bottom b) Bottom to top c)Left to right d) right to left

Ans: **Top to Bottom**

28. The cicuit given below acts as ____________ filter?



Ans: **High Pass filter**