NATIONAL BUSINESS TECHNICAL EXAMINATION BOARD

NATIONAL CERTIFICATE EXAMINATION

ELECTRONICS WORKS

MAY/JUNE 2009

QUESTION 1

1a. Draw the basic diagram for a bridge rectifier circuit.

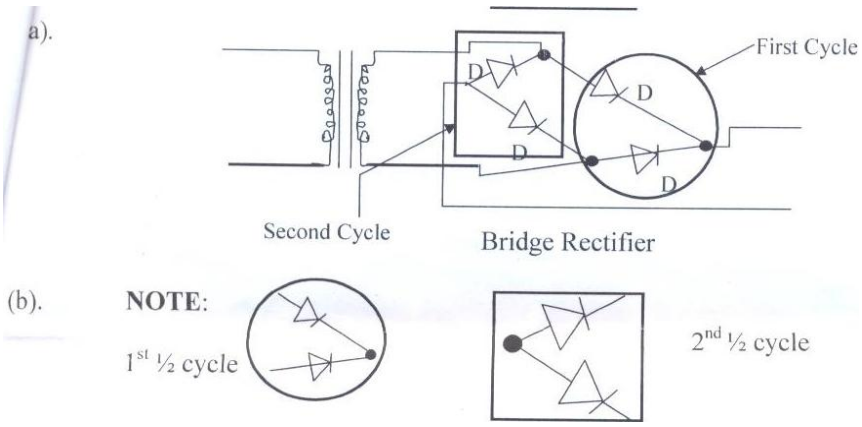
b. Referring to your diagram in "1a" draw around two diodes that conduct at the same time on the first half cycle, then draw a square around the two diodes that conduct on the second half cycle.

C. Sketch a diagram that compares the a.c input for a bridge rectify circuit with its output when:

i. There is no output filtering

ii. There is a capacitor (c) – type output filter.

ANSWER



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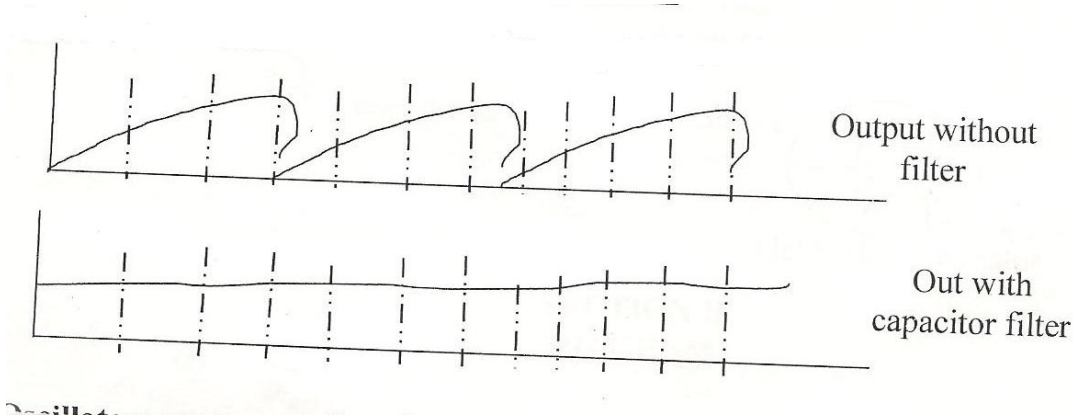
c. Full wave bridge rectification before & after c-type filter action.



QUESTION 2

a. What is an oscillation?
b. State two types of oscillators
c. Briefly explain the operation of a stable multivibration
d. Write short note on the following
   i. Open circuit
   ii. Short circuit

ANSWER

2a. **Oscillators** are non rotating electronic device that generate device alternating current at desired frequencies. E.g an electronic organ uses oscillated waves to produce musical sounds. Blinking signal light uses oscillated waves. Carrier waves produced by radio station are oscillated waves. In order word: **An oscillator** is a circuit that generates and sustains an output signal without an input signal supplied by another circuit or source.

b.
   i. Lc sine wave oscillators
   ii. Hartley oscillator
   iii. Colpitts' oscillators
   iv. Crystal oscillator
   v. RC sine wave oscillators

c. **AN ASTABLE MULTIVIBRATOR:** is a type of RC oscillator that generates square or rectangular wave forms. The term astable means not stable. This type of circuit has a no stable state , and it produces its output as a result of continually seeking a stable state. The frequency of oscillation is determined by the charge time of the RC networks. Stable multivibrators are also known as free running multivibratiors and/ or relaxation oscillator.

d. **OPEN CIRCUIT:** Is any break in the current path that is undesired, such as a broken wire or component, or designed such as open switch contacts in a lighting circuit.

SHORT CIRCUIT: It is an undesired very low resistance path across two points in a circuit. It may be across one component, several component, several components, or across the entire circuit. There can be designed shorts in circuits, such as purposeful dumpers or close switch.

QUESTION 3

a. Explain the main differences between intrinsic and extrinsic semiconductor materials.
b. State FOUR advantages of transistor over a thermionic valve.
c. Draw the schematic symbol of the following solid state devices
i. Zener diode
ii. Tunnel diode
iii. Field effect transistor

3a. **Intrinsic semiconductors:** is one which is made of the semiconductors material in its extremely pure from i.e nothing has been added to it. While **extrinsic semiconductor** is a semiconductor in which a very small amount of impurity (doping agent) has been added.

b.

TRANSISTOR	THEMIONIC VALVE
1. Heat sensitive	Required heat
2. Small size	Large and bulkier
3. Require very little power for operation	Require much more operating power
4. Long life	Short life
5. Low cost	Very cost
6. Non sensitive to shock	Higher sensitive to shock
Little weight	Heavier
Ruggedness	Fragile

C. i. Zener diode

ii. Tunned diode

iii. Field effect transistor

QUESTION 4

4a. Draw block diagram of monochrome TV receiver and briefly review the nature of input and output signals at various sections.

b. What are the causes of vertical rolling in a TV receiver?

c. State FOUR picture quality of television receiver.

ANSWER

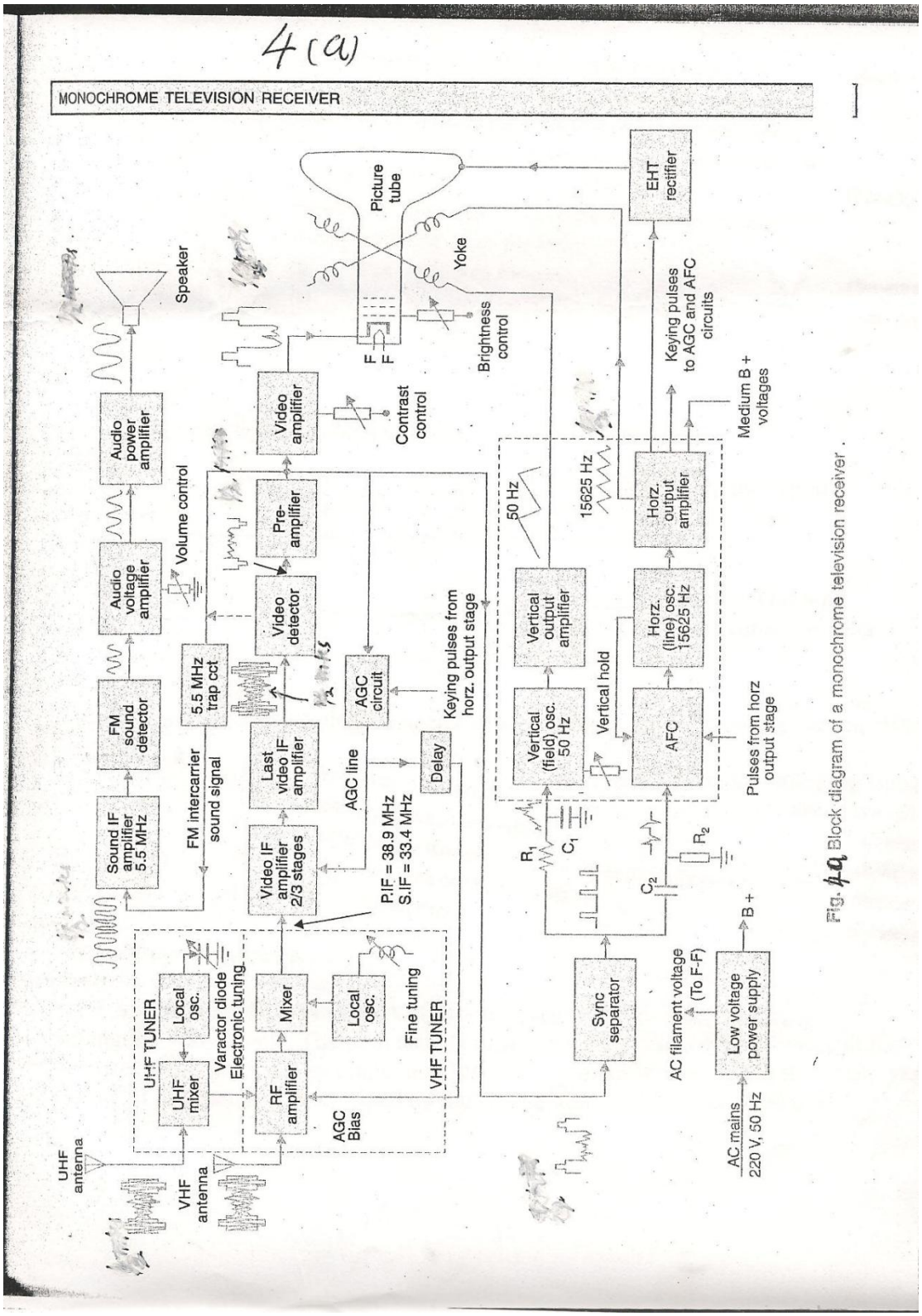


Fig. 4a Block diagram of a monochrome television receiver.

b.

i. Low main voltage
ii. Improper antenna orientation
iii. Detective components in integrator
iv. Detective component in vertical oscillator control grid
v. Insufficient or distorted signal from integrator network
vi. Detective resistor in feedback loop
vii. Detective grid capacitor
viii. Suppression of sync pulses in video I.F section due to low gain.

ci. Brightness ii. Contrast iii. Picture detail iv. Aspect ratio

QUESTION 5

5a. Explain how scanning is achieved in a television system

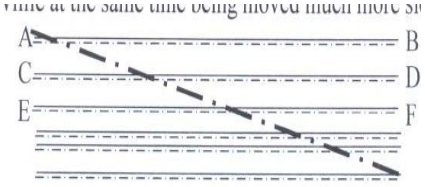
b. What is the purpose of synchronization signal/

c. Outline the difference between a black and white TV signals and a NTSC colour TV signal

ANSWER 5

5a. **Scanning:** is the division of the picture into tinning elements. This can be achieved by the following method.

In the electronic system the switches are replaced by electron beam which is caused to scan both the image of the scene to be transmitted and also the scene to the receiver. Since the electron beam has almost no inertia, it can operate at high speed and with high precision. In this case is moved at constant speed from left to right such as "A to B" in fig. T. While at the same time being moved much more slowly from top to the picture.



When reaches point 'B' is rapidly moved to point 'C' on the next line and continue to move along the next C-D and scans the elements of the line. When the beam reaches the end of the last line, at point 'Z' it returns rapidly to the starting point A and whole process is repeated.

5b. The purpose of sync chronization signals is to keep in step, the transmitter and receiver signals so that there is agreement between the baseboard channel selections at the two ends.

Black & White signal	**Colour T.V. signal**
It consists of luminance (y) signal and sound Fm signal	Consist of luminance (y) chromininace © signal (Hue). And sound fm signal

QUESTION6

6. **(a)** What are the advantage of frequency modulation over amplitude modulation
   (b) Explain the following terms
   (i) De-emphasis
   (ii) Limiter
   (iii) Dynamic range
   (iv) FM discriminator
   (v) Sensitivity

ANSWER

6a. 1. The major advantage of FM over AM is noise reduction.
FM receivers are capable of a greater dynamic range than AM receivers.

2. All transmitter power in FM is useful where as in AM most of it is in carrier which services no useful purpose.
3. In FM, there is no adjacent channel interface.
4. Little watts of audio power are required to produce 100% modulation. AM is verse vassal.
5. The efficiency of transmission is very high.

(b)i. **DE-EMPHASIS** network is to reduce frequency modulation noise which enters the transmitted signal while route from the transmitter to the receiver as well **as** any such noise which may enter at the front end of the receiver**.**

ii. **LIMITER CIRCUIT:** Is used to remove amplitude variations from the FM intermediate frequency. It removes any AM noise which may enter at the front end of the receiver.
Clipping by the limiter eliminates noise but does not affect the information content of the signal because the information is contained in the frequency variations not in the amplitude variation.

iii. **DYNAMIC RANGE:** Is the complete range of volume from no sound to maximum sound.

iv. **F.M DISCRIMINATOR:** for the detection of F.M waves the method usually employed involves the conversion of FM into AM and then application.

Demodulation of an FM waves involves:

- Conversion of frequency variations produced by modulation signal into corresponding
- Amplitude variations
- Rectification of modulating signal
- Elimination of RF component of the modulated wave
- For the FM detection we need a circuit in which magnitude of output voltage varies in accordance with the instantaneous frequency in the input voltage. Such circuits are called discriminators.

vi. **SENSITIVITY:** is a measure of the ability of a receiver to respond to weak signals.

QUESTION 7

7a. Write short note on the following:
   i. Radio transmitter
   ii. Radio receiver

iii. Selectivity in a radio set

iv. Automatic gain control

v. Automatic frequency response

b. Draw the block diagram of an AM super dyne receiver.

Indicate the signal in each state

ANSWER 7

a. **Radio Transmitter**: is to generate radio-waves for transmission into space

ii. **Radio receiver**: is a device that picks up electromagnetic waves sent out by a transmitter amplifiers them, detest them, so that they can be hard and amplifiers them to normal listening level, in order ward.

A radio receiver: is a device that picks up all electromagnetic wave present to space, it select the wanted radio wave and reject others, it extract the intelligence contained in the modulated signals and produces an audio frequency output of sufficient power to operate the loud speaker or other receiving device such as (CRT, GSM screen e.t.c)

iii. **Selectivity in a record set:** The selectivity of a receiver is it's ability to reject unwanted signals. In **order word** is the ability of a receiver to separate the signals of the desires station from the signals of the other station?

iv. **Automated gain control:** AGC is a method of automatically turning the volume to loud when the signal becomes weaker and to soft when the signal becomes stronger.

AGC is needed to keep the output of the detector steady since the receiver carriers

Varies in strength through fading.

It also protect the I.F from overlapping which causes various forms of distortion.

v. **Automated frequency control:** is used in FM radio. As well as TV receivers, to ensure a stable intermediate frequency.

7b