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ABSTRACT

The 135 clock-hour course for the 12th year consists of outlines for blocks of instruction on transistor applications to basic circuits, principles of single sideband communications, maintenance practices, preparation for FCC licenses, application of circuits to advanced electronic systems, nonsinusoidal wave shapes, multivibrators, and blocking and shock-excited oscillators. Behavioral objectives are specified. A 26-item bibliography of references and films is included together with a posttest sample. (AG)

AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

DADE COUNTY PUBLIC SCHOOLS

Course Outline
INDUSTRIAL ELECTRONICS 3 - 9327
(Advanced Electronics Systems I)
Department 48 - Course 9327.03

DIVISION OF INSTRUCTION•1971

D A D E   C O U N T Y   P U B L I C   S C H O O L S

1 4 1 0   N O R T H E A S T   S E C O N D   A V E N U E

M I A M I,   F L O R I D A   33132

Course Outline

INDUSTRIAL ELECTRONICS 3 - 9327
(Advanced Electronics Systems I)

Department 48 - Course 9327.03

the division of

VOCATIONAL, TECHNICAL AND ADULT EDUCATION

Dr. E. L. Whigham, Superintendent of Schools
Dade County Public Schools
Miami, Florida 33132

Published by the Dade County School Board

Course Description

9327	48	9327.03	Advanced Electronics Systems I
State Category Number	County Dept. Number	County Course Number	Course Title

This course of study includes transistor circuits and systems, single sideband systems, trouble shooting, F.C.C. License preparation, high frequency techniques, nonsinusoidal waves, and special oscillators. The laboratory experiments relating to the text material will be covered.

Prerequisite: Satisfactory completion of quinmester Course 9327.02.

Clock Hours: 135

PREFACE

The following quinmester course outline entitled Advanced Electronic Systems I, is the third quinmester course of the twelfth year. There will be four other quinmesters as follows:

9327.01 Basic Electronic Circuits
9327.02 Basic Electronic Systems
9327.04 Advanced Electronic Systems 2
9327.05 Independent Study in Electronics

This quinmester course will be available to all students who satisfactorily complete the post-test of quinmester course 9327.02.

The course material is presented to the student in 135 hours classroom-laboratory instruction. The content of this course will be covered in seven blocks and concluded by a post-test.

Upon completion of this course the student will be well grounded in the areas of transistor circuits and systems, single sideband systems, trouble shooting, high frequency technique, nonsinusoidal waves and special oscillators, and should be prepared for a second class F.C.C. License.

The teaching methods will vary according to the ability of the individual student. As the content of the course varies, teaching techniques which lend themselves to each particular situation, are employed. The instructor uses demonstrations and lectures which are supplemented by the performance of laboratory experiments and assignments by the student. The instruction is further developed by the use of films, information sheets, diagrams, and other aids which make the instruction more meaningful.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the quinmester advisory committee, and the Vocational Teacher Education Service, and has been approved by the Dade County Vocational Curriculum Committee.

TABLE OF CONTENTS
with Suggested Hourly Breakdown

GOALS

The student must be able to:

1. Demonstrate an understanding of basic transistor circuits such as amplifiers and oscillators.
2. Demonstrate an understanding of single sideband transmission and reception.
3. Trouble shoot basic electronic circuits.
4. Take and pass the F.C.C. Second Class Radiotelephone Examination.
5. Demonstrate an understanding of nonsinusoidal wave shapes.
6. Demonstrate an understanding of multivibrators, blocking oscillators, and shock-excited oscillators.

SPECIFIC BLOCK OBJECTIVES

BLOCK I - TRANSISTOR APPLICATIONS TO BASIC CIRCUITS

The student must be able to:

1. Explain the differences between Class A, Class B, and Class C transistor amplifiers.
2. Name the four ways that transistor amplifiers can be coupled together and explain the advantages and disadvantages of each.
3. Explain the operation of a frequency selective amplifier.
4. Name four types of oscillators.
5. List four types of modulators and explain the operation of each.
6. Draw a block diagram of a superheterodyne receiver and explain the function of each block.

BLOCK II - PRINCIPLES OF SINGLE SIDEBAND COMMUNICATIONS

The student must be able to:

1. Name the two main advantages of single sideband over AM transmission.
2. Explain the difference between the phase shift and filter method of single sideband transmission and reception.

BLOCK III - MAINTENANCE PRACTICES

The student must be able to:

1. Calibrate each kind of test equipment available in the lab.
2. Demonstrate that he can find equipment and parts in an electronic catalog.
3. List several preventive maintenance procedures that should be observed on electronic equipment.

BLOCK IV - PREPARATION FOR F.C.C. LICENSES

The student must be able to:

1. Pass the F.C.C. Third Class Radiotelephone Examination.
2. Pass the F.C.C. Second Class Radiotelephone Examination.

BLOCK V - APPLICATION OF CIRCUITS TO ADVANCED ELECTRONIC SYSTEMS

The student must be able to:

1. Discuss some of the history behind our modern electronic circuits.
2. Explain what is meant by the electronic time-measurement system.
3. Describe the properties of a vacuum tube that are most important at high frequencies.

BLOCK VI - NONSINUSOIDAL WAVE SHAPES

The student must be able to:

1. Define the terms square wave, rectangular wave, sawtooth wave, triangular wave, and trapezoidal wave and explain the harmonic content of each.
2. Explain what is meant by differentiation and integration.
3. Determine the D.C. component of a wave.
4. Explain the difference between differentiation and integration.

BLOCK VII - MULTIVIBRATORS, BLOCKING AND SHOCK-EXCITED OSCILLATORS

The student must be able to:

1. Explain completely the operation of an astable plate coupled multivibrator through one cycle of operation.
2. Draw the schematic of a one-shot multivibrator.
3. List some uses of an Eccles-Jordan multivibrator.
4. Draw the schematic of a blocking oscillator and explain its operation.
5. Draw the schematic of a shock-excited oscillator and explain its operation.

Course Outline

INDUSTRIAL ELECTRONICS 3 - 9327
(Advanced Electronics Systems I)

Department 48 - Course 9327.03

I. TRANSISTOR APPLICATIONS TO BASIC CIRCUITS

A. Transistor Audio Amplifiers
1. Classification of transistor amplifiers
2. Performance analysis of single stage Class A amplifiers
3. Description of transistor audio amplifiers:
a. Cascade audio amplifiers
b. RC coupled audio amplifiers
c. Untuned transformer coupled audio amplifiers
d. Manual gain controls audio amplifiers

B. Description and Theory of Operation of Tuned or Frequency Selective Amplifiers
1. Narrow band tuned amplifiers
2. Wide band tuned amplifiers

C. Transistor Oscillators
1. Requirements for transistor oscillators
2. Description and theory of operation of typical junction transistor oscillators:
a. The Armstrong audio oscillator
b. Hartley RF oscillators
c. The Colpitts RF oscillator
d. The Clapp RF oscillator

D. Transistor Transmitter Circuits
1. Requirements for transistor modulators
2. Description and theory of operation of transistor modulators:
a. Nonlinear or square law modulators
b. Balanced modulators
c. Large signal or linear collector modulators
d. Amplitude modulator oscillators

E. Transistor Receiver Circuits
1. Description and theory of operation of receiver circuits:
a. Mixers
b. Converters
c. Second detectors
d. Automatic gain controls
2. Analysis of a typical AM superheterodyne receiver

II. PRINCIPLES OF SINGLE SIDEBAND COMMUNICATIONS

A. Fundamentals of Single Sideband Communication Systems
1. Single sideband considerations

2. Advantages in power output and signal to noise ratio
3. Introduction to single sideband concepts

B. Theory of Operation of Single Sideband Transmitters
1. Description of filter method of single sideband signal generation
2. Description of phase shift method of single sideband signal generation
3. Comparison of filter and phase shift single sideband generation

C. Theory of Operation of Single Sideband Receivers
1. Description of filter method of single sideband reception
2. Description of phase shift method of detection

III. MAINTENANCE PRACTICES

A. Test Equipment
1. Calibration methods
2. Description and operation of frequency meters
3. Miscellaneous test equipment:
   a. Description and function
   b. Operating procedure

B. Parts Catalogs
1. Use of catalogs for ordering parts
2. Use of catalogs for current reference of new equipment in the electronic field

C. Preventive Maintenance
1. Preventive maintenance during operation:
   a. Transmitters
   b. Receivers
2. Preventive maintenance of component parts:
   a. Transmitter components
   b. Receiver components
   c. Antenna systems

IV. PREPARATION FOR F.C.C. LICENSES

A. F.C.C. Radiotelephone Third Class License Preparation
1. Familiarization with element one, basic law for radiotelephone operator
2. Familiarization with element two, basic operating practice for radiotelephone operators

B. Element Three F.C.C. Radiotelephone Second Class License Preparation
1. Review of mathematics for electronics

IV. PREPARATION FOR F.C.C. LICENSES (Contd.)

2. Review of electrical fundamentals
3. Review of electronics fundamentals
4. Review of radio transmission and reception

V. APPLICATION OF CIRCUITS TO ADVANCED ELECTRONIC SYSTEMS

A. Introduction to Advanced Electronic Circuit Technology
   1. History of advanced electronic circuit developments
   2. Description of an electronic time measurement system
   3. Applications of electronic test instruments

B. Higher Frequency Techniques
   1. Description of the distributed properties in circuit elements
   2. The use of line sections as circuit elements
   3. Description of lumped property components
   4. Description of vacuum tubes in the 30 to 1000 Mc range

C. Microsystems Electronics
   1. Reasons for miniaturization of electronic components
   2. Methods of producing microelectronic components

VI. NONSINUSOIDAL WAVE SHAPES

A. Review of the Sine Wave
   1. Description of harmonics
   2. Distortion of the sine wave:
      a. Analysis of even order harmonic content
      b. Analysis of odd order harmonic content

B. Composition and Analysis of Square Waves
   1. The ideal square wave
   2. Harmonic content
   3. High frequency effects
   4. Low frequency effects
   5. Use of square waves

C. Rectangular Waves
   1. Description
   2. Uses

D. Composition and Analysis of Sawtooth Waves and Triangular Waves
   1. Harmonic content
   2. High frequency effects
   3. Low frequency effects
   4. Description of triangular and peaked waves

E. Composition and Analysis of Multisegmented Waves
   1. Two-segmented waves

2. Trapezoidal waves
3. Staircase wave forms

F. Analysis of Curved Wave Forms and Transients
1. Description of differentiation and integration processes
2. Exponential wave forms
3. Hyperbolic and parabolic wave forms
4. Description and analysis of transients:
   a. Aperiodic waves
   b. The transient response of a circuit

G. D.C. Components and A.C. Components of Wave Forms
1. Determining the D.C. component of a wave form
2. Determining D.C. level
3. Fourier analysis of A.C. wave forms
4. Determining A.C. level

H. Pulses
1. Characteristics of pulses
2. Harmonic content
3. Description of step voltages
4. Gating and trigger pulses:
   a. Definitions
   b. Uses

VII. MULTIVIBRATORS, BLOCKING AND SHOCK-EXCITED OSCILLATORS

A. Principles of Multivibrators
1. Description of RC network action
2. Description of tube switching action
3. Theory of operation of astable multivibrators:
   a. The plate coupled, free-running multivibrator:
      (1) Circuit operation
      (2) Determination of frequency
      (3) Stability
   b. The cathode coupled, free-running multivibrator
   c. Synchronization of free-running multivibrators:
      (1) Sine-wave synchronization
      (2) Pulse synchronization
4. Theory of operation of monostable multivibrators:
   a. One-shot plate coupled multivibrator
   b. One-shot cathode coupled multivibrator
5. Theory of operation of bistable multivibrators:
   a. Eccles-Jordan multivibrator
   b. Double-input bistable multivibrator

B. Principles of Blocking Oscillators
1. Description of pulse transformers
2. Theory of operation of blocking oscillator circuits:
   a. Free-running, single-swing blocking oscillator

VII. MULTIVIBRATORS, BLOCKING AND SHOCK-EXCITED OSCILLATORS (Contd.)

b. Triggered single-swing blocking oscillator
c. Self-pulsing blocking oscillator

C. Principles of Shock-Excited Oscillators
1. Theory of operation of shock-excited oscillators
2. Description of shock-excited oscillator circuits:
a. Shock-excited ringing oscillator
b. Shock-excited peaking oscillator

VIII. QUINMESTER POST-TEST

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(Advanced Electronics Systems I)

Basic References:

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Supplementary References:

8. Federal Communications Commission. Study Guide and Reference Material for Commercial Radio Operator Examinations. Washington, D.C.: U. S. Government Printing Office, 1955. Pp. 266.

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11. Kiver, Milton S. Transistors. 3rd ed. New York: McGraw-Hill Book Company, Inc., 1962. Pp. 528.

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13. Transistor Manual. 7th ed. Syracuse, New York: General Electric Company, Semiconductor Products Department, 1964. Pp. 652.

14. U. S. War Department. Preventive Maintenance Guide for Radio Communication Equipment. (TB Sig 178) (TO 16-1-183) Washington, D.C.: U. S. Government Printing Office, 1945. Pp. 184.

Films:

		Dade County Film Ordering Number
1.	Principles of Ultrasonics. 16 mm. 15 mm. B/W. Sound. 1955. McGraw-Hill Book Company, Inc., Text Film Department.	1-10726
2.	Printed Circuit Story. 16 mm. 25 min. Color. 1961. Bray Studios, Inc.	1-31382
3.	Radio Receivers: Principles and Typical Circuits. 16 mm. 17 min. B/W. Sound. 1942. United World Films, Inc.	1-13125
4.	Radio Shop Techniques. 16 mm. 38 min. B/W. Sound. 1943. United World Films, Inc.	1-40109
5.	Radio Waves. 16 mm. 29 min. Color. Sound. 1961. McGraw-Hill Book Company, Inc., Text Film Department.	1-30208
6.	Signal Generator Operation. 16 mm. 9 min. B/W. Sound. 1945. United World Films, Inc.	1-05568
7.	Single Sideband Radio: Introduction. 16 mm. 19 min. B/W. Sound. 1960. Norwood Films.	1-13148
8.	Sound Waves and Their Sources. 16 mm. 11 min. B/W. Sound. 1950. Encyclopedia Britannica Films, Inc.	1-01840
9.	Standing Waves on Transmission Lines. 16 mm. 23 min. B/W. Sound. 1945. United World Films, Inc.	1-13152
10.	Transistors: Servicing Techniques. 16 mm. 17 min. B/W. Sound. 1960. Norwood Films.	1-13169
11.	Tube Tester Operation (Basic). 16 mm. 10 min. B/W. Sound. 1952. United World Films, Inc.	1-05592
12.	Wanted: Skilled Workers (Trade Preparation Training). 16 mm. 22 min. Color. Sound. 1958. University of Texas, Industrial Education Department.	1-13180.

A P P E N D I X

Quinmester Post Test Sample

Quinmester Post Test

Name ______________________________ Date ______________ Score ____

1. A common-collector amplifier is characterized by:

   a. High input impedance and low output impedance
   b. Low input impedance and high output impedance
   c. Low input impedance and low output impedance
   d. High input impedance and high output impedance

2. The low frequency response of a transistorized R/C coupled audio amplifier is limited mainly by:

   a. The coupling capacitor
   b. The transistor Beta
   c. The distributed capacitance of the circuit
   d. The emitter resistor

3. The highest theoretical output power from a class A single ended transistor amplifier with a 15 watt collector dissipation rating is:

   a. 10 watts
   b. 5 watts
   c. 15 watts
   d. 7.5 watts

4. In a multistage transistorized IF amplifier, the stage that primarily determines the overall noise figure of the IF strip is the:

   a. Last
   b. Second
   c. First
   d. Comon collector

5. The common base transistor amplifier confi ur tion has:

   a. Moderate input and output impedances
   b. High input impedance and moderate output impedance
   c. Low input impedance and high output impedance
   d. Low input and output impedances

6. Linear collector modulation requires modulating power that is:

   a. Greater than the emitter bias
   b. Relatively great
   c. Great enough to produce D.C. emitter circuit bias
   d. Relatively little

7. Transistor detectors are usually biased:

   a. In the linear region of operation
   b. Near cutoff
   c. Near the maximum safe cissipation point
   d. Beyond cutoff

8. The type of interstage coupling that can offer the best impedance matching between transistor stages is:

   a. RC coupling
   b. LC coupling
   c. Transformer coupling
   d. Back coupling

9. Audio amplifiers are operated Class A because:

   a. Of its cheaper operation
   b. It is more efficient
   c. It has less distortion
   d. They are designed around Class A transistors

10. When an SSB transmitter is modulated, the output of the modulator stage before the sideband filter contains:

   a. The upper sideband only
   b. The lower sideband only
   c. Both upper and lower sidebands
   d. The carrier only

11. Two advantages of the use of SSB transmission are:

   a. Higher fidelity and less power needed
   b. It is easily adaptable to AM or FM transmission and the available power can be concentrated into one sideband
   c. It uses less of the available frequency spectrum and the available power can be concentrated into one sideband
   d. Higher fidelity and it uses less of the available frequency spectrum

12. When a small portion of the undesired sideband is transmitted along with the desired sideband, the method of transmission is called:

   a. Single sideband
   b. Double sideband
   c. Vestigial sideband
   d. Double sideband suppressed carrier

13. In a filter system SSB transmitter, the key circuits are the:

   a. Linear amplifier and phase inverter
   b. High frequency VFO and balanced mixer
   c. RF carrier oscillator and carrier reinsertion amplifier
   d. Balanced modulator and sideband filter

14. The term "pilot carrier" refers to:

   a. An unsuppressed carrier
   b. A small amount of the carrier transmitted along with the sideband
   c. A carrier generated by the receiver and reinserted at the detector stage
   d. A small amount of the transmitter signal used to indicate that the transmitter is turned on

15. Double sideband receivers operate on the superheterodyne principle, SSB receivers operate on the:

a. Tuned radio frequency (TRF) principle
b. Superheterodyne principle also
c. Master oscillator, power amplifier (MOPA) principle
d. Frequency shift keying principle

16. When no "pilot carrier" is transmitted, in order to receive the SSB signal·

a. A local RF carrier insertion oscillator must be in the receiver
b. A conventional AM receiver must be used
c. A product detector must be included in the receiver
d. Double or triple conversion receivers are required.

17. To produce the same coverage as an AM transmitter, an SSB transmitter requires a peak power rating of approximately:

a. 3/4 Less than that of the AM system
b. 1/2 Less than that of the AM system
c. 1/4 Less than that of the AM system
d. 1/8 Less than that of the AM system

18. An AM signal can be effectively cancelled at the receiving location because of:

a. Improper phase relationship between the carrier and sidebands
b. A faulty transmitter
c. A phase reversing circuit in the receiver
d. An AM signal cancelling circuit in the receiver

19. Multi-path fading of an SSB signal:

a. Causes a change in the fidelity of the received signal, but does not affect the intelligibility
b. Causes a change in the phase of the received signal, but does not affect the fidelity
c. Is called amplitude-vs.-fidelity distortion
d. Has no effect on an SSB signal whatsoever

20. In regular AM modulation:

a. The carrier alone contains the intelligence
b. The carrier and the sidebands both contain the intelligence
c. One sideband contains 3/4 of the intelligence
d. The sideband alone contains the intelligence

21. One of the most important and critical requirements of SSB equipment is:

a. Frequency coverage
b. The type of antenna used
c. Frequency stability
d. That it must have a good ground

22. Controlled carrier SSB:

a. Is the type of transmission in which the carrier is manually controlled at the transmitter
b. Is a type of SSB in which the power output of the transmitter is maintained effectively constant regardless of the presence or absence of modulation

23. Vestigal sideband transmission is used extensively in the transmission of:

a. Space shots
b. Television
c. Ship-to-shore
d. Police broadcast

24. Output amplifiers in SSB transmitters are generally operated:

a. Class A because of high efficiency
b. Class B
c. Class C because of high efficiency
d. Class C push-pull

25. An F.C.C. License may be issued to:

a. United States citizens only
b. Anyone wishing to operate radio equipment
c. Anyone visiting the United States
d. Anyone, provided they file an application

26. Antenna tower lights should be:

a. Checked daily by visual observation or automatic indicator
b. Checked morning and night by visual observation
c. Checked only when the automatic indicator is not working
d. Checked every three months

27. The third harmonic of 3000 Hz is:

a. 1000 Hz
b. 6000 Hz
c. 9000 Hz
d. 30,000 Hz

28. The output of an amplifier is increased from 3 watts to 6 watts. This represents an increase of:

a. 12 db
b. 3 db
c. 10 db
d. 2 db

29. A harmonic is:

   a. A musical instrument
   b. A multiple of the fundamental frequency
   c. Even multiples of the fundamental frequency
   d. Odd multiples of the fundamental frequency

30. The waveform that is fundamental to all waveforms is:

   a. Square wave
   b. Sawtooth wave
   c. Peaked wave
   d. Sine wave

31. A square wave is:

   a. A fundamental frequency and an infinite number of in-phase odd harmonics
   b. A fundamental frequency and an infinite number of in-phase even harmonics
   c. A fundamental frequency and an infinite number of out-of-phase odd harmonics
   d. A fundamental frequency and an infinite number of out-of-phase even harmonics

32. A square wave having a rise time of one microsecond will have its highest frequency component equal to:

   a. 1 megahertz
   b. 500 kilohertz
   c. 5 megahertz
   d. 100 kilohertz

33. A square wave is symetrical when:

   a. The positive and negative portions of the waveform are equal with respect to time
   b. The positive and negative portions of the waveform are unequal with respect to time
   c. Its rise time is equal to its fall time
   d. Its number of odd harmonics is equal to its number of even harmonics

34. An ideal sawtooth wave is one whose rise time is:

   a. Exponential and fall time instantaneous
   b. Linear and fall time exponential
   c. Linear and fall time instantaneous
   d. Instantaneous and fall time linear

35. A sawtooth wave contains a fundamental and an infinite number of:

   a. Odd harmonics
   b. Odd and even harmonics
   c. Even harmonics
   d. Square waves

36. A trapezoidal wave is composed of:

a. Part of a sawtooth and part of a sine wave
b. Part of a square wave and part of a sine wave
c. Part of a sawtooth wave and part of a square wave
d. Part of a sawtooth wave, a square wave, and a peaked wave

37. When the area of a positive loop of a waveform is subtracted from the area of the negative loop, the resultant is called the:

a. D.C. component
b. A.C. component
c. Reference line
d. Loop difference

38. The left side of a pulse is called:

a. Leading edge
b. Trailing edge
c. Riser
d. Fall

39. A pulse which turns a circuit on or off for an extremely short period of time is called a:

a. Gate
b. Square wave
c. Trigger
d. Transient

40. Another name given to an Eccles-Jordan multivibrator is:

a. Free-running multivibrator
b. Self-flopping circuit
c. Flip-flop circuit
d. Squegging oscillator

41. The Eccles-Jordan multivibrator:

a. Requires a negative pulse to complete a cycle of operation
b. Requires a positive pulse to complete a cycle of operation
c. Requires two trigger pulses to complete a cycle of operation
d. Can be operated free-running or synchronized

42. The most desirable waveform for synchronizing a multivibrator is a:

a. Sine wave
b. Trigger pulse
c. Sawtooth wave
d. Triangular pulse

43. The cathode coupled multivibrator:

a. Is also known as a one shot multivibrator
b. Uses a cathode resistor to maintain one tube always at cutoff, until it is triggered by an external pulse
c. Has one grid returned to the cathode
d. Has equal bias voltages on the two cathodes

44. In a plate coupled multivibrator, the approximate frequency of operation is determined by:

a. The grid resistors
b. The plate resistors
c. The coupling capacitors
d. The coupling capacitors and the grid resistors

45. When synchronizing a single swing blocking oscillator, it is usually desirable to have:

a. The free-running frequency higher than the forced frequency
b. The free-running frequency lower than the forced frequency
c. The free-running frequency the same as the forced frequency
d. None of the above is correct. A blocking oscillator cannot be synchronized

46. In a multivibrator circuit:

a. A rise in the grid voltage of one tube causes a corresponding increase in the plate current of the other tube.
b. An increase of current through the load resistor of one tube causes the grid voltage of the other tube to decrease
c. When current is flowing in one tube, its associated plate coupling capacitor is charging.
d. The cathodes must stay positive with respect to the grids in order to complete a full cycle of operation

47. The function of a multivibrator is to produce:

a. Triggering pulses
b. Exponential waveforms at the grid
c. Square or rectangular waves
d. Pure sine waves

48. A multivibrator that operates continuously without the aid of an input signal is called:

a. Astable
b. Bistable
c. Monostable
d. Duostable

49. A multivibrator where the plates of the tubes are coupled to the grids of the opposite tube is called:

a. Cathode coupled
b. Grid coupled
c. Flip flop
d. Plate coupled

50. The shock excited oscillator produces a peaked wave rather than a sine wave by:

a. Controlling the frequency of the input pulses
b. Use of grid-leak bias
c. Use of the low "Q" circuit
d. Use of the distributed capacitance

ANSWER KEY TO QUINMESTER POST TEST

1.	a	26.	a
2.	a	27.	c
3.	d	28.	b
4.	c	29.	b
5.	c	30.	d
6.	b	31.	a
7.	b	32.	b
8.	c	33.	a
9.	c	34.	c
10.	c	35.	b
11.	c	36.	c
12.	c	37.	a
13.	d	38.	a
14.	b	39.	c
15.	b	40.	c
16.	a	41.	c
17.	d	42.	b
18.	a	43.	d
19.	a	44.	d
20.	d	45.	b
21.	c	46.	b
22.	b	47.	c
23.	b	48.	a
24.	b	49.	d
25.	a	50.	c