



301
ECE/CE

Jharkhand University of Technology, Ranchi

Diploma 3rd Semester Examination, 2024 NEP)

Subject : Analog Electronics

Subject Code : ECE 301

Time Allowed : 3 Hours

Full Marks : 70

Pass Marks : 21

Answer in your own words.

Answer any five questions in which Question No.1 is compulsory.

The figures in the margin indicate full marks.

All questions carry equal mark.

1. Choose the correct alternative:

2x7=14

(i) The average value of a sine wave over one cycle is
(a) zero (b) peak value
(c) RMS value (d) None of these

(ii) In a common emitter (CE) amplifier configuration, the signal is applied to the
(a) base (b) emitter
(c) collector (d) None of these

(iii) What is the main advantage of a switched-mode power supply (SMPS) over a linear power supply?
(a) Higher efficiency (b) Simpler design
(c) More heat dissipation (d) Larger size

(iv) Which special purpose diode is primarily used in microwave frequency applications due to its negative resistance property?
(a) Varactor Diode (b) Tunnel Diode
(c) PIN Diode (d) Schottky Diode

(v) What is the primary function of a varactor diode?
(a) Acts as a high-speed switch (b) Converts light into electrical energy
(c) Provides variable capacitance (d) Generates microwave signals

(vi) What is the purpose of biasing in a transistor amplifier?
(a) To increase power consumption.
(b) To fix the operating point for proper operation.
(c) To reduce the gain of the amplifier.
(d) To eliminate the need for a DC power supply.

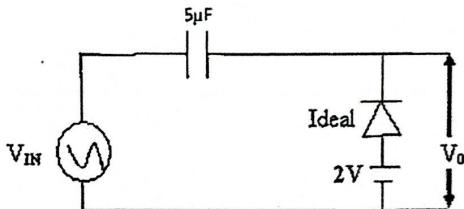
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(2)

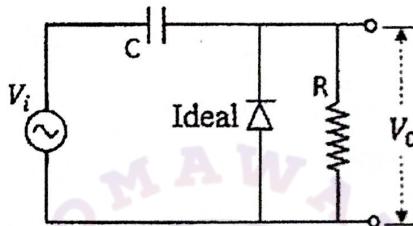
(vii) The efficiency of a Class A power amplifier is typically

- 100%
- around 75%
- less than 50%
- more than 90%

2. (a) Sketch the output waveform of the circuit given below if V_{IN} is a triangular wave with 5V amplitude.

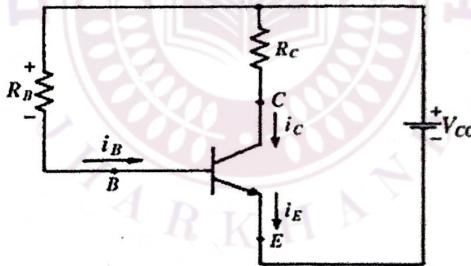


(b) Sketch the output waveform of the circuit given below if V_{IN} is a triangular wave with 5V amplitude. Also write the condition for clamper to work. 7+7



3. Discuss Power Supply. 14

4. For the circuit given below if $\beta = 100$, $V_{CEO} = 7.7V$, $R_c = 8k\Omega$, $V_{CC} = 15.7V$, extract the values of I_{CQ} and R_B . Assume the transistor material is Silicon. 14



5. Design an Hartley oscillator using Op-Amp with frequency of $(10/\pi)$ kHz. 14

6. Why is an instrumentation amplifier needed in measurement and control systems? Explain its advantages over a basic differential amplifier. 14

7. Write short notes on the following (any two): 7x2=14

- Astable multivibrator using IC 555.
- Colpitt's Oscillator
- Differentiator and Integrator using Operational Amplifier
- Phase Locked Loop (PLL)



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ECE

Jharkhand University of Technology, Ranchi
Diploma 3rd Semester Examination, 2024 (NEP)

Subject : Electronic Measurements and Testing Techniques

Subject Code : ECE 304

Full Marks : 70

Time Allowed : 3 Hours

Answer in your own words.

Answer five questions in which Question No. 1 is compulsory.

All questions carry equal marks.

$2 \times 7 = 14$

1. Choose the correct options:

- (i) The accuracy of an instrument is defined as
 - (a) the ability to reproduce the same reading under unchanged conditions.
 - (b) the degree of closeness to the true value.
 - (c) the smallest change in input that can be detected.
 - (d) the ability to maintain a constant reading.
- (ii) The function of a bridge circuit is to
 - (a) amplify signals.
 - (b) measure unknown resistance, capacitance, or inductance.
 - (c) generate waveforms.
 - (d) provide feedback in control systems.
- (iii) In a capacitive transducer, the capacitance changes due to
 - (a) variation in magnetic field.
 - (b) change in dielectric constant, area, or distance between plates.
 - (c) changes in resistance.
 - (d) induced voltage.
- (iv) Which of the following sensors works based on temperature variation?

(a) Hall effect sensor	(b) Thermocouple
(c) Proximity sensor	(d) LVDT
- (v) The key feature of a Digital Storage Oscilloscope (DSO) is:
 - (a) instantaneous display of waveforms.
 - (b) storing and analyzing digital waveforms.
 - (c) generating square wave signals.
 - (d) automatic generation of a sine wave.



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(2)

(vi) The main advantage of a PMMC instrument is

- (a) high accuracy and reliability.
- (b) ability to measure both AC and DC.
- (c) ruggedness and low cost.
- (d) high-frequency response.

(vii) What is the primary purpose of a sweep frequency generator?

- (a) Generating a fixed frequency waveform
- (b) Generating a range of frequencies for testing frequency response
- (c) Measuring harmonic distortion in signals
- (d) Producing digital clock signals

2. (a) What are the static and dynamic characteristics of an instrument? Explain with examples.

(b) Explain the block diagram of a generalized electronic measurement system. 7+7

3. (a) Compare AC and DC bridges and explain their applications.

(b) Discuss the concept of DC voltmeters using PMMC meters. Explain voltmeter sensitivity and loading effect. 7+7

4. (a) Explain the working principles of Hall Effect transducers, LVDT and Thermistors.

(b) What are proximity sensors and PIR sensors? Explain their working principles. 7+7

5. (a) Explain the working principle of an electronic voltmeter with a focus on the chopper amplifier type voltmeter.

(b) What are series and shunt-type ohmmeters? Explain their working principles and applications. 7+7

6. (a) Explain the working principle of electronic counters with a block diagram.

(b) What precautions should be taken to prevent instrument damage? Discuss general precautions for instrument safety. 7+7

7. Write short notes on *any four*: 3.5×4=14

- (a) Foil type strain gauges
- (b) Electrodynamometer
- (c) Digital frequency meter
- (d) Function generator
- (e) Digital multimeter

Jharkhand University of Technology, Ranchi

Diploma 3rd Semester Examination, 2024 (NEP)

Subject : Logic Design using Verilog

Subject Code : ECE 302

Time Allowed : 3 Hours

Full Marks : 70

Candidates are required to give their answers in their words as far as practicable.

The figures in the right hand margin indicate full marks.

Answer any five questions in which Question No.1 is compulsory.

1. There are seven multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which only one is correct, choose the correct answer: 2x7=14

(i) What is the main reason for the growing importance of VLSI technology?

- (a) Increased power consumption
- (b) Miniaturization and cost reduction of electronic device
- (c) Limited processing speed
- (d) Decreased complexity of circuits

(ii) Which type of modeling in Verilog HDL describes the flow of data between components?

- (a) Switch level
- (b) Structural
- (c) Data flow
- (d) Behavioral

(iii) What is the purpose of Xilinx software in VLSI design?

- (a) To perform software development for general-purpose applications
- (b) To design and simulate digital circuits for FPGA and CPLD
- (c) To write software code for microcontrollers
- (d) To simulate analog circuits only

(iv) In Verilog HDL, which of the following is a lexical convention used for comments?

- (a) // for single-line comments
- (b) /* for multi-line comments
- (c) # for documentation comments
- (d) Both (a) and (b)

(v) Which operator is used for bit-wise AND operation in HDL?

- (a) &&
- (b) &
- (c) |
- (d) ~



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(2)

(vi) In Verilog, the basic structure of a module starts with:

- (a) module name
- (b) begin
- (c) assign
- (d) initial

(vii) Which of the following is used to declare ports in Verilog for a module?

- (a) input, output, inout
- (b) assign, initial, always
- (c) module, endmodule
- (d) begin, end

2. Explain JK flip flop with truth table, present state next state table and excitation table. Also deduct characteristics equation for JK flip flop. 14

3. Write Behavioral Verilog description for BCD to seven segment decoder for common mode display using if-else, Case. 14

4. Write Verilog code for Half adder and also write code for the test bench. 14

5. Provide an example of implementing a simple Boolean function using a PAL. For example, implement the function $F=A'B+AB' F=A'B+AB' F=A'B+AB'$ using PAL and explain the steps involved. 14

6. Explain registers with the help of 4 bit SISO registers using D flip-flop. 14

7. Write short notes on *any two*:

- (a) Asynchronous Mod 6 counter
- (b) ADC
- (c) Structural modeling in Verilog
- (d) FPGA

$7 \times 2 = 14$

Jharkhand University of Technology, Ranchi
Diploma 3rd Semester Examination, 2024 (NEP)

Subject : Communication Systems

Subject Code : ECE 303

Time Allowed : 3 Hours

Full Marks : 70

Answer in your own words.

Answer any five questions in which Question No. 1 is compulsory.

The figures in the margin indicate full marks.

All questions carry equal marks.

1. Explain the terms:

7x2=14

- (i) The bandwidth of a series RLC circuit is defined as:
 - (a) the difference between the maximum and minimum frequencies.
 - (b) the frequency at maximum impedance.
 - (c) the range of frequencies where the circuit resonates.
 - (d) the difference between the upper and lower cutoff frequencies.
- (ii) A filter that passes frequencies above its cutoff frequency is called
 - (a) low-pass filter.
 - (b) high-pass filter.
 - (c) band-pass filter.
 - (d) band-stop filter.
- (iii) In Norton's theorem, the equivalent circuit consists of
 - (a) a current source in series with a resistance.
 - (b) a voltage source in parallel with a resistance.
 - (c) a voltage source in series with a resistance.
 - (d) a current source in parallel with a resistance.
- (iv) In optical fiber communication, total internal reflection occurs when
 - (a) the light ray strikes the core-cladding boundary at less than the critical angle.
 - (b) the refractive index of the core is less than the cladding.
 - (c) the light ray strikes the core-cladding boundary at an angle greater than the critical angle.
 - (d) the light ray travels in a straight line through the fiber.
- (v) In Frequency Division Multiplexing (FDM):
 - (a) multiple signals share the same frequency band.
 - (b) each signal is assigned a unique frequency band.
 - (c) signals are transmitted in discrete time slots.
 - (d) only digital signals can be multiplexed.



(vi) In fiber optics, the angle of acceptance is related to

- (a) Numerical aperture
- (b) Critical angle
- (c) Refractive index
- (d) Total internal reflection

(vii) What does the modulation index in frequency modulation (FM) represent?

- (a) The ratio of the carrier frequency to the signal frequency
- (b) The maximum frequency deviation divided by the modulating signal frequency
- (c) The amplitude of the carrier signal
- (d) The ratio of the modulating signal amplitude to the carrier amplitude

2. (a) State and explain Thevenin's theorem with an example.

(b) Derive the condition for parallel resonance and explain the significance of the resonance frequency. 7+7

3. (a) Explain the classification of filters and derive the cutoff frequency formula for a high-pass filter.

(b) Describe the operation of symmetrical • type attenuator with a circuit diagram. 7+7

4. (a) What are attenuators? Explain their classification and discuss their applications.

(b) Define the following antenna terminologies: polarization, radiation pattern, antenna gain, directive gain, directivity, power gain and antenna resistance. 7+7

5. (a) Explain the working principle of a dish antenna. Describe the feed mechanisms, including Cassegrain feed and horn feed.

(b) What are the fundamentals of electromagnetic waves? Explain the electromagnetic spectrum and its significance. 7+7

6. (a) Explain the Analog pulse modulation techniques PAM, PPM and PWM. Use appropriate waveforms to illustrate each technique.

(b) Draw the block diagrams of a frequency modulation (FM) transmitter and receiver. Also, provide expression for frequency deviation and modulation index. 7+7

7. Write short notes on *any four*:

- (a) Ground wave propagation
- (b) Binary Phase shift keying (PSK)
- (c) Frequency Division Multiplexing (FDM) and its applications
- (d) Error Control Codes
- (e) Sampling

3.5×4=14