International Islamic University Chittagong (IIUC)

Department of Electronic and Telecommunication Engineering

Final Examination

Program: **B.sc (in ETE)**
Course Code: **ETE-2341**
Total Marks: **50**

Semester: **Spring 2023**
Course Title: **Analog Electronics**
Time: **2 Hours 30 Minutes**

(i) Answer all the questions. The figures in the right-hand margin indicate full marks.
(ii) Course Outcomes (COs) and Bloom's Levels are mentioned in additional Columns.

Course Outcomes (COs) of the Questions	
CLO1	Acquire the basic knowledge of operational amplifier, oscillator, multivibrator and power amplifier related theory and application.
CLO2	Construct and test different of operational amplifier circuits and measure their gain and frequency response in a group.
CLO3	Design basic electronics project based amplifier.
CLO4	Apply the necessary learning skills in Electronics industries.

Bloom's Levels of the Questions						
Letter Symbols	**R**	**U**	**Ap**	**An**	**E**	**C**
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Part A

Q1.	a)	Explain the RC Low Pass filter circuit with an appropriate diagram. Justify your answer?	**CLO1**	**An**	**2**
	b)	To ensure an effective load resistance of 10kΩ when matching a 16Ω speaker load to an amplifier, what should be the required transformer turn ratio?	**CLO1**	**E**	**3**
	c)	Explain the concept of frequency response in the context of an RC-coupled amplifier?	**CLO2**	**An**	**5**
		OR			
Q1.	a)	What is the significance of a heat sink in a power amplifier and why is it necessary?	**CLO3**	**An**	**3**
	b)	A Class B push-pull amplifier has an output power of 40 watts and consumes a total power of 100 watts. Calculate the power efficiency of the amplifier	**CLO2**	**Ap**	**3**
	c)	Explain the operation of a transformer-coupled Class B amplifier and how it achieves high power efficiency.	**CLO3**	**C**	**4**
Q2.	a)	Calculate the overall gain in decibels (dB) of a single-stage amplifier with a voltage gain of 50, a collector load of 5 kΩ, and an input impedance of X kΩ. X represents the last digit of your ID number, and if the last digit is zero, consider it as 2.	**CLO4**	**C**	**4**
	b)	Explain the working principle and circuit diagram of a Class C amplifier.	**CLO2**	**U**	**4**
	c)	Illustrate the push-pull amplifier circuit using a neat diagram and properly label all the essential components.	**CLO3**	**Ap**	**2**

Part B

Q3.	a)	Evaluate the line regulation, load regulation, and ripple rejection of a specific voltage follower DC regulator. Given that the input voltage (Vin) is 15 ± 10% with Rs = 20 ohm, the output voltage (Vout) is 4.7V with R = 330 ohm, and the maximum load current is 50mA. Assume the ripple voltage (Vripple) to be the last two digits of your ID number. If any of the last two digits are zero, consider Vripple as 2.	CLO3	C	6
	b)	Explain the working principle of a shunt feedback voltage regulator and include a well-labelled diagram to illustrate its operation.	CLO4	Ap	4

Q4.	a)	Explain the basic operation and key characteristics of an operational amplifier (op-amp). Discuss the ideal op-amp model, highlighting its input and output properties, gain, and input impedance. Also, describe the significance of negative feedback in op-amp circuits.	CLO1	R	5
	b)	Describe the operation of an op-amp differentiator circuit, including its circuit configuration, key components, and input-output characteristics.	CLO2	An	5
		OR			
Q4.	a)	Justify by mathematical derivation, ' the closed loop voltage gain is independent of the op amps internal open-loop voltage gain'.	CLO3	U	4
	b)	Discuss the significance of the saturation property of operational amplifiers in their role as comparators.	CLO4	C	6
Q5.	a)	What is Zero crossing detector? Explain zero crossing detector using inverting operational Amplifier?	CLO1	Ap	4
	b)	What is comparator? And explain comparators?	CLO2	An	3
	c)	What is Active filter? Explain Band pass and band stop filter?	CLO3	R	3