JHARKHAND UNIVERSITY OF TECHNOLOGY

DIPLOMA 3RD SEMESTER EXAMINATION

ANALOG ELECTRONICS (ECE 301)

Time: 3 Hours **SET: 2** **Full Marks: 70**

INSTRUCTIONS:

1. Question No. 1 is Compulsory (MCQ).
2. Answer any **FOUR** questions from the remaining (Q.2 to Q.7).
3. Figures in the margin indicate full marks.
4. Draw circuit diagrams wherever necessary in your answer sheet.

Q.1. MULTIPLE CHOICE QUESTIONS [2 × 7 = 14]

(i) Which amplifier configuration is used for Impedance Matching?

(a) Common Base (b) Common Emitter
(c) Common Collector (d) None

(ii) The feedback factor (β) in a Wein Bridge Oscillator is:

(a) 1/3 (b) 1/29
(c) 1/2 (d) 1

(iii) A Monostable Multivibrator has how many stable states?

(a) Zero (b) One
(c) Two (d) Three

(iv) The maximum efficiency of a Class A transformer-coupled amplifier is:

(a) 25% (b) 50%
(c) 78.5% (d) 100%

(v) Which filter is used to block DC and pass AC signals?

(a) Low Pass (b) High Pass
(c) Band Pass (d) Band Stop

(vi) The input impedance of an Ideal Op-Amp is:

(a) Zero (b) Infinite
(c) 100 Ohm (d) 1 kOhm

(vii) Ripple factor of a Full Wave Bridge Rectifier is:

(a) 1.21 (b) 0.48
(c) 0.406 (d) 1.11

SECTION B (Long Answer Type)

Q.2. (a) Explain the working of **555 Timer as a Monostable Multivibrator**. Derive the expression for its pulse width (T = 1.1RC). **[7]**

Q.2. (b) Differentiate between **Linear Power Supply** and **Switch Mode Power Supply (SMPS)** on the basis of efficiency, size, and complexity. **[7]**

Q.3. (a) Explain the concept of **Feedback in Amplifiers**. What are the advantages of Negative Feedback? Derive the expression for Gain with Feedback (Af). **[7]**

Q.3. (b) Explain the construction and working of a **Crystal Oscillator**. Why does it provide high frequency stability? **[7]**

Q.4. (a) Define **Thermal Runaway** in transistors. Explain how it can be avoided using proper biasing techniques. **[7]**

Q.4. (b) Compare **Class A, Class B, and Class C Amplifiers** based on:

i. Operating Point (Q-point)
ii. Conduction Angle
iii. Efficiency
iv. Distortion

[7]

Q.5. (a) What is an **Op-Amp**? List the characteristics of an Ideal Op-Amp (Voltage Gain, Input Impedance, Bandwidth, Slew Rate). **[7]**

Q.5. (b) Explain the working of a **Bridge Rectifier** with a Capacitor Filter. How does the capacitor reduce ripple? **[7]**

Q.6. [Long Answer] Draw the circuit diagram of **Wein Bridge Oscillator** using Op-Amp. Explain its working principle and derive the condition for sustained oscillations. **[14]**

Q.7. WRITE SHORT NOTES ON (ANY FOUR): [3.5 × 4 = 14]

a. Schmitt Trigger (Hysteresis)
b. Tunnel Diode
c. Active vs Passive Filters
d. Barkhausen Criteria
e. Opto-Coupler

✅ SOLUTION KEY

MCQ Answers: (i) c, (ii) a, (iii) b, (iv) b, (v) b, (vi) b, (vii) b.

Q2(a) Hint: In Monostable mode, output stays high for T = 1.1 * R * C seconds after a trigger.

Q6 Hint: Wein Bridge uses a series RC and parallel RC network. The condition for oscillation is R2 = 2*R1 (Gain = 3) and f = 1/(2πRC).

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