

**M.Phil. (Science) Examination**  
**PHYSICS—I**  
**(Advanced Electronics)**

Time : Three Hours]

[Maximum Marks : 80

**Note :—**(1) Answer any **FIVE** questions.

(2) All questions carry equal marks.

1. (A) Sketch the basic structure of an n-channel Junction Field Effect Transistor (JFET) and explain its working. 6
- (B) Define pinch off voltage for JFET . 2
- (C) Show small signal model of JFET and obtain expressions for gain and input impedance for an amplifier. 4
- (D) Draw and explain the working of a source follower using JFET. 4
2. (A) Write design rules for monolithic layout for IC. 4
- (B) Explain in brief :
  - (i) Pin Connections
  - (ii) Crossovers
  - (iii) Isolation islands. 6

- (C) Sketch the circuit of a Logarithmic Amplifier using OPAMP. Derive the necessary equation. 4
- (D) How can temperature effect be reduced in logarithmic amplifier ? 2
3. (A) Discuss with necessary theory the working of a parallel resonant circuit. 8
- (B) What is sharpness of resonance ? 4
- (C) Explain the use of parallel resonant circuit as an input stage of a super heterodyne receiver. 4
4. (A) Define Laplace Transform. 3
- (B) Discuss one application of Laplace Transform. 6
- (C) Explain how a computer can help in the circuit analysis before it is actually implemented. 7
5. (A) Draw circuit diagram of RC coupled amplifier. 2
- (B) What is Miller Effect ? 2
- (C) Discuss with mathematical analysis, the gain frequency response of such amplifier, for low, middle and high frequency regions. 4+4+4
6. Explain construction and working of the following types of transducers :
- (i) Capacitance
- (ii) Displacement
- (iii) Photoelectric
- (iv) Temperature. 4+4+4+4

7. (A) Write truth table for a full adder. 2
- (B) Draw Karnaugh maps for sum and carry outputs. 6
- (C) Implement the result using NAND-NAND gates. 4
- (D) Minimize the four variable logic function using Karnaugh map :
- $$f(A, B, C, D) = \Sigma m(0, 1, 2, 3, 5, 7, 8, 9, 11, 14).$$
- 4
8. (A) Draw a block diagram showing architecture of microprocessor. 4
- (B) Explain the function of each block. 12
9. (A) Explain with waveform Pulse Width Modulation (PWM) 3
- (B) Draw block diagram and explain the generation of PWM. 5
- (C) Discuss the working of a PWM signal detection circuit. 5
- (D) Write advantages and disadvantages of PWM. 3
10. (A) Explain how a colour picture signal is obtained from a camera. 5
- (B) How is the combination of these signals done to transmit colour and black and white areas ? 4
- (C) Discuss the construction and working of colour picture tube. 7