

**Bihar Engineering University, Patna**  
**End Semester Examination - 2022**

Course: B.Tech.  
Code: 101302

Semester: III  
Subject: Basic Electronics

Time: 03 Hours  
Full Marks: 70

**Instructions:-**

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

**Q.1 Choose the correct option of the following: (Answer any seven)**

**[2 x 7 = 14]**

- (a) In a semiconductor diode, the barrier potential offers
  - (i) Opposition to free electrons in the N region and holes in P region
  - (ii) Opposition to minority carriers in P region and majority carriers in N region
  - (iii) Opposition to only minority carriers in both regions
  - (iv) Opposition to only majority carriers in both regions
  
- (b) A diode is a
  - (i) Non-linear device
  - (ii) Bilateral device
  - (iii) Linear device
  - (iv) None of the above
  
- (c) The emitter of transistor is
  - (i) Lightly doped
  - (ii) Heavily doped
  - (iii) Moderately doped
  - (iv) None of the above
  
- (d) A transistor is a \_\_\_\_\_ operated device.
  - (i) Current
  - (ii) Voltage
  - (iii) Both voltage and current
  - (iv) None of the above
  
- (e) For  $I_{DSS} = 9\text{mA}$ ,  $V_p = -3.5\text{V}$  and  $V_{GS} = -2\text{V}$ , value of  $I_D$  is
  - (i) 9 mA
  - (ii) 1.65 mA
  - (iii) 2.55 mA
  - (iv) 10 mA
  
- (f) Which of the following statement is true about FET?
  - (i) It has high output impedance
  - (ii) It has high input impedance
  - (iii) It has low input impedance
  - (iv) It does not offer any resistance
  
- (g) For a JFET, the value of  $V_{DS}$  at which  $I_D$  becomes essentially constant is the
  - (i) Pinch-off voltage
  - (ii) Cut-off voltage
  - (iii) Breakdown voltage
  - (iv) Ohmic voltage
  
- (h) Slew rate is defined as the:
  - (i) Maximum rate of change of output voltage with time
  - (ii) Minimum rate of change of output voltage with time
  - (iii) Moderate rate of change of output voltage with time
  - (iv) None of the above

- (i) In a BJT if the both emitter and collector junction are reverse biased it is said
- (i) active
  - (ii) saturation
  - ✓ (iii) cut off
  - (iv) none of above
- (j) A differential amplifier has a differential gain of 20000, CMRR = 80dB. The common mode gain is given by
- (i) 2
  - (ii) 1
  - (iii)  $\frac{1}{2}$
  - (iv) 0

- Q.2** (a) Discuss with the help of circuit diagram, the purpose of providing negative feedback and positive feedback. [7]
- (b) Draw the circuit diagram of voltage-shunt feedback amplifier and derive the expression of closed-loop voltage gain using op-amp. [7]

- Q.3** (a) Explain the working of BJT as an amplifier. [7]
- (b) With a neat circuit diagram explain the Voltage Divider Bias circuit by giving its exact analysis. [7]

- Q.4** (a) Explain op-amp as Differentiator and Integrator. Also draw the output Waveforms of the same. [7]
- (b) Calculate the CMMR (in decibel) for the circuit measurement of  $V_d = 1 \text{ MV}$ ,  $V_o = 120 \text{ MV}$ ,  $V_c = 1 \text{ mV}$  and  $V_o = 20 \mu\text{V}$ . [7]

- Q.5** (a) Describe the RC Phase-shift oscillator with circuit diagram. [7]
- (b) A single-stage amplifier has voltage gain of 10 and bandwidth of 1MHz. Three such stage are cascaded and negative feedback of 10% is applied to the cascade stage. Find out the overall voltage gain and bandwidth of cascade stage with feedback. [7]

- Q.6** (a) Write the properties of ideal operational amplifier. [7]
- (b) Draw the pin configuration of 741 op-amp IC. Explain its working. [7]

- Q.7** (a) Draw basic structure of n-channel JFET and describe its working operation. [7]
- (b) Draw transfer curve. Also, Explain briefly the construction and working of p-channel enhancement MOSFET. [7]

- Q.8** (a) Draw circuit diagram of transistor amplifier in CE, CB, CC configuration. Discuss the comparison of their important characteristics. [7]
- (b) Discuss the need for stabilization? List the various factors responsible for shift in Q-point in a transistor. Explain the effect of each parameter on stability of Q-point. [7]

- Q.9** Write short notes on any two of the following: [7x2]
- (i) UJT
  - (ii) SCR
  - (iii) Zener diode
  - (iv) Photo diode

