Student Exam No._____

# GANPAT UNIVERSITY

## B. Tech. Semester III[rd] (EC) Electronics and Communication Engineering

## Regular Examination November – December 2013

## 2EC302 - ELECTRONIC DEVICES AND CIRCUITS

**Time: 3 Hours** **Total Marks: 70**

**Instruction:**

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

### Section - I

| | | | |
|---|---|---|---|
| **Que. – 1** | **(A)** | Define h-parameter of a transistor. Draw the equivalent circuit of a transistor with h-parameters. Derive the general expressions for current gain, voltage gain, input impedance, output impedance for a transistor amplifier circuit using h-parameters. | 8 |
| | **(B)** | Define active, saturation and cutoff regions in a transistor. Sketch family of Common Emitter output characteristics for a transistor. | 4 |
| | | **OR** | |
| **Que. – 1** | **(A)** | Explain Miller's theorem. Also derive expressions for Miller effect input and output capacitances. | 6 |
| | **(B)** | For the circuit shown in figure. 1, draw the dc load line and plot the Q point. Sketch the Q point when β changes from 100 to 150 and 100 to 50. Show that Q point is sensitive to variation in β. | 6 |
| **Que. – 2** | **(A)** | Define stability factors with respect to transistor biasing. State the factors affecting the stability. | 4 |
| | **(B)** | Write short note on phototransistor. | 4 |
| | **(C)** | Draw three basic configuration of NPN transistor. | 3 |
| | | **OR** | |
| **Que. – 2** | **(A)** | For the amplifier circuit shown in figure. 2, draw ac equivalent circuit using h-parameter model and r-parameter model. Derive expressions for input impedance, output impedance for given circuit using any one of the small signal model. | 6 |
| | **(B)** | What is the effect of emitter bypass capacitor on low frequency response of an amplifier? Explain the effect of parasitic capacitance and wiring capacitance on high frequency response of a BJT amplifier. | 5 |
| **Que. – 3** | **(A)** | Draw and explain Emitter bias circuit. Derive expressions for d.c. voltages and currents in the circuit. Find $I_C$ and $V_{CE}$ for given $R_B$ = 220 KΩ, $R_C$= $R_E$= 1 KΩ, $V_{CC}$ = 10 V, β= 100. | 7 |
| | **(B)** | Define: Bandwidth of an amplifier, 3-dB frequency, AC Beta($\beta_{ac}$). | 3 |
| | **(C)** | Why biasing is required? Explain in brief. | 2 |

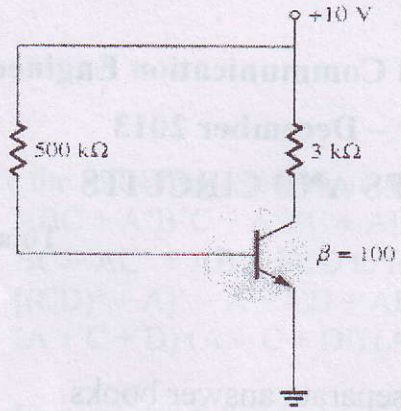


Figure. 1 [Que. 1(B)]

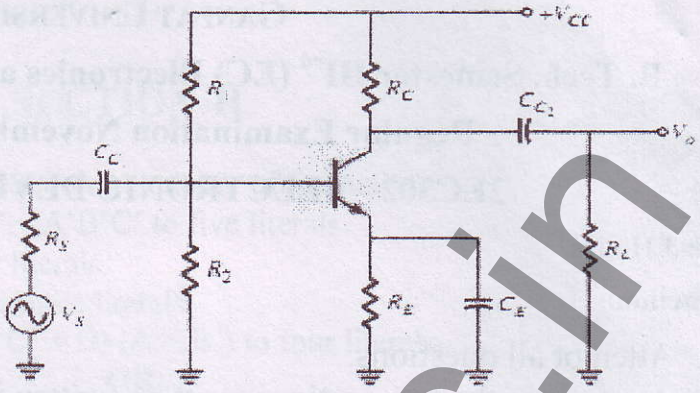


Figure. 2 [Que. 2(A)]

## Section - II

| | | | |
|---|---|---|---|
| Que. – 4 | (A) | Describe charge storage phenomenon of normal p-n junction diode and how this phenomenon affects the operation of diode at high frequencies. | 7 |
| | (B) | Determine I, $V_1$, $V_2$, and $V_o$ for the series dc configuration of Figure 3. | 5 |
| | | **OR** | |
| Que. – 4 | (A) | How static, dynamic and average resistance of diode is calculated? Explain in detail. | 7 |
| | (B) | Determine the currents $I_1$, $I_2$, and $I_{D2}$ for the network of Figure 4. | 5 |
| Que. – 5 | (A) | Explain basic operation and characteristics of n-channel enhancement type MOSFET with neat and clean diagram. | 6 |
| | (B) | What is the reason of cross-over distortion in class-B push pull power amplifier? Explain solution of it. | 5 |
| | | **OR** | |
| Que. – 5 | (A) | Determine $I_{DQ}$ and $V_{DSQ}$ for the enhancement-type MOSFET of Figure 5. | 6 |
| | (B) | Enlist the differences between Bipolar Junction Transistor and Field Effect Transistor. | 5 |
| Que. – 6 | (A) | Write a short note on photolithography process of IC fabrication. | 4 |
| | (B) | Determine the range of values of $V_{in}$ that will maintain the Zener diode of Figure 6. in the "on" state. | 4 |
| | (C) | Sketch a p-channel enhancement-type MOSFET with the proper biasing applied and indicate the channel, the direction of electron flow, and the resulting depletion region. | 4 |

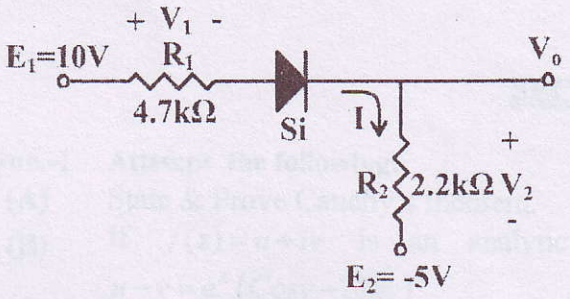


Figure. 3 [Que: 4(B)]

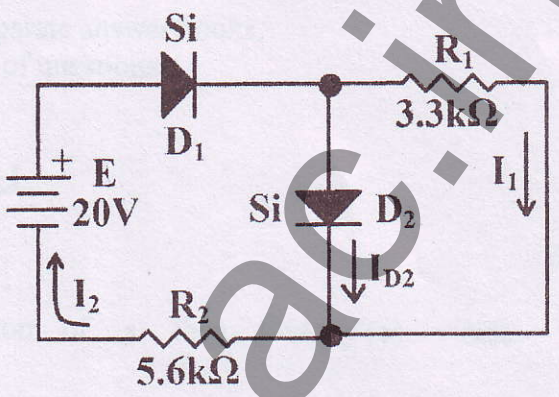


Figure. 4 [Que: 4(B)]

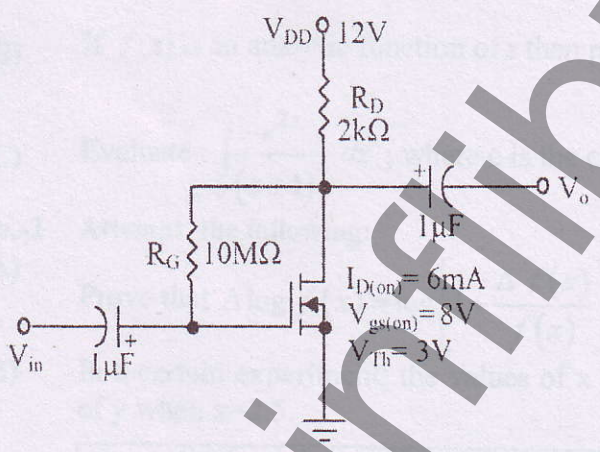


Figure. 5 [Que: 5(A)]

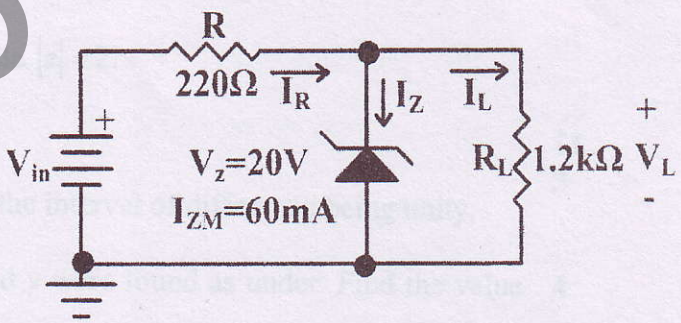


Figure. 6 [Que: 6(B)]

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