Code No:A109210203 | R09 | SET-1

B.Tech II Year I Semester Examinations, May-June, 2012
ELECTRONIC DEVICES AND CIRCUITS
(COMMON TO BME, CSE, EEE, ECE, ECC, EIE, ETM, IT, ICE, MCT)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) Explain the concept of diode capacitance. Derive expression for transition capacitance?

b) Find the value of D.C. resistance and A.C resistance of a Germanium junction diode at 25^0 C with reverse saturation current, I_o = 25μA and at an applied voltage of 0.2V across the diode. [8+7]

2. Define the following terms and derive the equations with respect to half-wave rectifier:
i) Ripple factor ii) Peak inverse voltage
iii) Rectification efficiency iv) % Regulation. [15]

3.a) With neat sketches and necessary waveforms, explain the input and output characteristics of a BJT in CB configuration. Also derive expression for output current.

b) Derive the relation among α, β and γ. [10+5]

4.a) Explain the basic requirements of transistor biasing. Verify these requirements in collector to base bias circuit.

b) Design a fixed bias circuit using silicon transistor, with the following specifications: V_{CC} = 16V, V_{BE} = 0.7V, V_{CEQ} = 8V, I_{CQ} = 4 mA & β= 50. [8+7]

5. Draw the circuit diagram, AC equivalent & small signal equivalent of Common Base amplifier using accurate h-parameter model. Derive expressions for A_{Vs}, A_{Is}, R_I & R_O. [15]

6.a) Explain the construction & operation of an N-channel enhancement and depletion MOSFET with the help of static drain characteristics and transfer characteristics.

b) Define pinch-off voltage and transconductance in field effect transistors. [12+3]

7.a) Draw the small-signal model of common drain FET amplifier. Derive expressions for voltage gain and output resistance.

b) Calculate voltage gain $A_V = V_O/V_i$ and R_O at 1KHz for the circuit shown in Figure.1. FET parameters are gm=2mA/V and rd =10k. Neglect capacitances. [8+7]

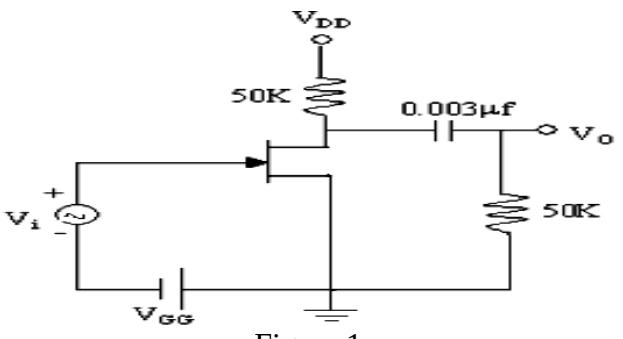

Figure.1

8. With neat energy band diagrams, explain the V-I characteristics of Tunnel diode in detail. Also explain the negative-resistance region in the characteristics and applications of Tunnel diode. [15]

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B.Tech II Year - I Semester Examinations, May-June, 2012
ELECTRONIC DEVICES AND CIRCUITS
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Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) What do you understand by depletion region at p-n junction? What is the effect of forward and reverse biasing of p-n junction on the depletion region? Explain with necessary diagrams.
b) Explain Zener and avalanche breakdown mechanisms in detail. [8+7]

2.a) Draw the circuit diagram of full-wave rectifier with inductor filter. Explain its operation with necessary equations.
b) A HWR circuit supplies 100mA DC current to a 250Ω load. Find the DC output voltage, PIV rating of a diode and the r.m.s. voltage for the transformer supplying the rectifier. [8+7]

3.a) With neat sketches and necessary waveforms, explain the input and output characteristics of a BJT in CE configuration. Also derive expression for output current.
b) Calculate the collector current and emitter current for a transistor with $\alpha = 0.99$ and $I_{CBO} = 50\mu A$ when the base current is $20\mu A$. [10+5]

4.a) What is thermal runaway in transistors? Obtain the condition for thermal stability in transistors.
b) Design a self bias circuit using silicon transistor to achieve a stability factor of 10, with the following specifications: $V_{CC} = 16V$, $V_{BE} = 0.7V$, $V_{CEQ} = 8V$, $I_{CQ} = 4$ mA & $\beta = 50$. [6+9]

5. Draw the circuit diagram, AC equivalent & small signal equivalent of Emitter Follower amplifier using accurate h-parameter model. Derive expressions for A_{Vs}, A_{Is}, R_I & R_O. [15]

6.a) With the help of neat sketches and characteristic curves explain the construction & operation of a JFET and mark the regions of operation on the characteristics.
b) Derive expression for transconductance in a field effect transistor. [10+5]

7.a) Draw the small-signal model of common source FET amplifier. Derive expressions for voltage gain and output resistance.
b) Give the UJT symbol and simplified equivalent circuit with external resistors included. Describe its negative-resistance nature, with the help of V-I characteristics. [7+8]

8.a) With neat sketches, explain the principle of operation of Schottky Barrier Diode.
b) With neat sketches, explain V-I characteristics of semiconductor Photo Diode. [8+7]

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B.Tech II Year - I Semester Examinations, May-June, 2012
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Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) Explain about various current components in a forward biased p-n junction diode.
b) With neat sketches and necessary waveforms explain about the regulation characteristics of Zener diode. [7+8]

2.a) Draw the circuit of full-wave rectifier with capacitor filter. Explain its operation with necessary equations.
b) A full wave rectifier circuit uses two silicon diodes with a forward resistance of 20Ω each. A DC voltmeter connected across the load of 1KΩ reads 55.4 volts. Calculate
i) I_{rms} ii) Average voltage across each diode
iii) ripple factor iv) Transformer secondary voltage rating. [7+8]

3.a) With neat sketches and necessary waveforms, explain the input and output characteristics of a BJT in CE configuration. Also derive expression for output current.
b) The reverse leakage current of the transistor when connected in CB configuration is 0.2 μA while it is 18 μA when the same transistor is connected in CE configuration. Calculate α and β of the transistor. [10+5]

4.a) Explain how I_{CO} variations are compensated with the help of diode and thermistor in transistor biasing circuits?
b) Design a collector to base bias circuit using silicon transistor to achieve a stability factor of 20, with the following specifications: V_{CC} = 16V, V_{BE} = 0.7V, V_{CEQ} = 8V, I_{CQ} = 4 mA & β= 50. [7+8]

5. Draw the basic circuit, ac equivalent and h-parameter model of a Common Emitter amplifier. Derive expressions for A_{Vs}, A_{Is}, R_I & R_O. [15]

6.a) Explain the construction & operation of an P-channel enhancement and depletion MOSFET with the help of static drain characteristics and transfer characteristics.
b) Explain why field effect transistor is called as unipolar and voltage controlled device. [12+3]

7.a) Draw the small-signal model of common gate FET amplifier. Derive expressions for voltage gain and input resistance.
b) A Common Source FET amplifier circuit shown in Figure.1 with unbypassed R_S has the following circuit parameters: R_d = 15K, R_S = 0.5K, Rg = 1M, r_d = 5K, g_m= 5mS and V_{DD} = 20 V. Calculate A_V & R_O. [8+7]

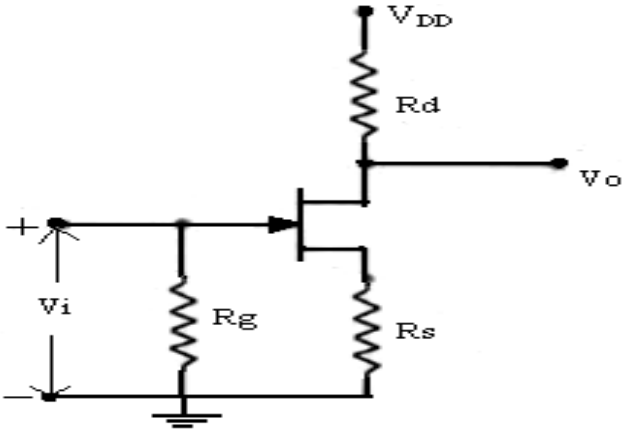

Figure.1

8. With neat energy band diagrams, explain the V-I characteristics of Tunnel diode in detail. Also explain the negative-resistance region in the characteristics. [15]

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Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) With neat sketches and necessary waveforms explain the volt ampere characteristics of PN diode.
b) Explain the temperature dependence of VI characteristics of PN diode.
c) Compare ideal and practical diodes. [8+4+3]

2.a) Draw the circuit of full-wave rectifier with L-section filter and derive expression for its ripple factor.
b) A 230 V, 60Hz voltage is applied to the primary of a 5:1 step down, center tapped transformer used in a full wave rectifier having a load of 900Ω .If the diode resistance and the secondary coil resistance together has a resistance of 100Ω, determine
i) dc voltage across the load. ii) dc current flowing through the load.
iii) dc power delivered to the load. iv) PIV across each diode. [7+8]

3.a) With the help of a neat diagram explain different current components in an NPN bipolar junction transistor.
b) With reference to bipolar junction transistors, define the following terms and explain.
i) Emitter efficiency.
ii) Base Transportation factor.
iii) Large signal current gain. [9+6]

4.a) Explain the basic requirements of transistor biasing. Verify these requirements in Emitter feedback bias circuit.
b) An NPN Silicon transistor with β=50 is used in a common emitter circuit with V_{CC}=10V, R_C=2K. The bias is obtained by connecting a 100K resistance from collector to base. Find
i) Q-Point ii) Stability factor, S [8+7]

5.a) Compare CB, CE and CC amplifiers in view of A_V, A_I, R_I & R_O.
b) Estimate A_V, A_I, R_I & R_O in an Emitter Follower circuit with R_E = 1K, h_{ie} = 1100Ω, h_{fe} = 50, h_{re} = 2.4x 10^{-4}, h_{oe} = 25 μA/V. [7+8]

6.a) With neat sketches, necessary equations explain the drain & transfer characteristics of MOSFET in enhancement mode.
b) Why is a Field Effect Transistor called unipolar & voltage controlled device? Explain the drain & transfer characteristics of a JFET in detail. [7+8]

7.a) i) Give symbol of UJT and mark required polarities for operation.
ii) Explain how the UJT can be used as a negative-resistance device with the aid of static characteristics.
b) A Common Drain FET amplifier circuit shown in Figure.1 has the following circuit parameters: R_S = 0.5K, Rg = 1M, r_d = 5K, g_m= 5mS and V_{DD} = 20 V. Calculate A_V & R_O. [8+7]

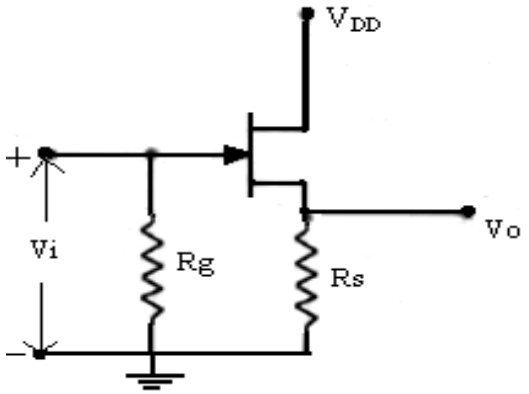

Figure.1

8.a) Draw the structure and two-transistor model of SCR, explain its operation with help of V-I characteristics.

b) Explain the operation of varactor diode with the help of neat diagrams. [10+5]

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