H.T.No. | | | | | | | | | | |

Code No: EC1514 **GEC-R14**

II B. Tech I Semester Supplementary Examinations, May 2016

ELECTRONIC DEVICES AND CIRCUITS

(**Electronics and Communication Engineering**)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B**. All Questions carry equal Marks.

PART-A

6 × 2 = 12M

1. What is meant by Zener breakdown?
2. Draw the circuit of a two-input diode AND gate.
3. Define threshold voltage.
4. Sketch the T-equivalent circuit model for MOSFET.
5. Why common collector circuit is called as an emitter follower ?
6. Draw the circuit of a MOSFET CG amplifier.

PART-B

4 × 12 = 48M

1. a) Sketch and explain the variation of charge density, electric field, and electrostatic potential within the transition region of a P^+-N junction. (6M)

   b) A one-sided abrupt Si N^+-P junction has an area of $10^{-4}cm^2$. If N_d is very high, $N_a = 10^{23}\ m^{-3}$, $\epsilon_{Si} = 11.8$, reverse voltage = 100V, T = 300°K, find the peak electric field at the junction and the depletion capacitance. (6M)

2. a) Draw and briefly explain various models of diode forward characteristic. (8M)

   b) Design a zener regulator to provide a regulated voltage of about 10V. The available 10V, 1W Zener is specified to have a 10V drop at a test current of 25mA. At this current its r_z is 7Ω. The raw supply available has a nominal value of 20V but can vary by as much as ±25%. The regulator is required to supply a load current of 0 to 20mA. Design for a minimum Zener current of 5mA. Find V_{z0} and the required value of R. (4M)

3. a) Draw and explain the capacitance-voltage characteristics of a MOS capacitor. (6M)

b) Consider a process technology for which L_{min} =0.4μm, t_{ox} =8nm, μ_n =450 cm^2 /V-s, and V_t = 0.7v

i) Find C_{ox} and k'_n .

ii) For a MOSFET with W/L = 8μm/.8 μm, calculate the values of V_{Gs} and V_{Dsmin} needed to operate the transistor in the saturation region with a dc current I_D = 100μA (6M)

4. a) Draw and explain the i_D - v_{DS} characteristics of an n-channel enhancement MOSFET. (6M)

b) An NMOS transistor having V_t = 1 V is operated in the triode region with v_{DS} small. With V_{GS} = 1.5 V, it is found to have a resistance r_{DS} of 1 kΩ. What value of V_{GS} is required to obtain r_{DS}=200Ω? Find the corresponding resistance values obtained with a device having twice the value of W. (6M)

5. a) Draw and explain static CB output characteristics. (6M)

b) A transistor amplifier is fed with a signal source having an open-circuit voltage v_{sig} of 10 mV and an internal resistance R_{sig} of 100k Ω. The voltage v_i at the amplifier input and the output voltage v_0 are measured both without and with a load resistance R_L =10k Ω connected to the amplifier output. The measured results are as follows: (6M)

	V_i(mV)	V_0(mV)
Without R_L	9	90
With R_L connected	8	70

Find i) Overall Voltage gain ii) Input Resistance iii) Output Resistance

6. a) Draw the circuit of a CE amplifier, its small-signal hybrid-Π model and derive expressions for R_{in}, A_v, and R_{out}. (8M)

b) A common-emitter amplifier is biased to operate at I_C = 0.2 mA and has a collector resistance R_C = 24 kΩ. The transistor has β=100 and a large Early voltage, V_A. The signal source having a resistance of 10 kΩ is directly coupled to the base, and C_{C1} and R_B are eliminated. Find R_{in}, and the voltage gain A_{vo}. (4M)

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