

**3E1641**

Roll No. \_\_\_\_\_

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**3E1641**

**B.Tech .III Semester (Main/Back) Examination -2014**  
**3EE1A-Electronics Devices & Circuits**

**Time : 3 Hours**

**Maximum Marks : 80**  
**Min. Passing Marks : 24**

**Instructions to Candidates:**

Attempt any **five** questions, selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

**Unit - I**

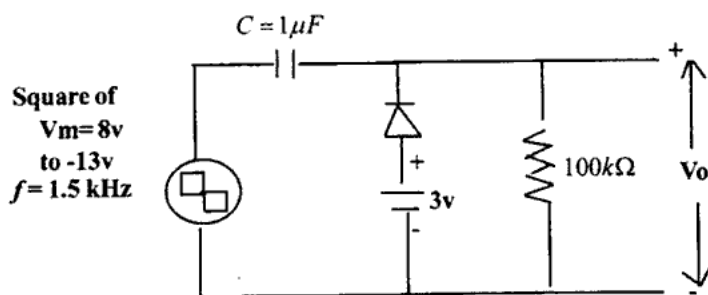
1. a) Explain Energy band theory of crystals. On its basis bring out the difference between Insulator, Semiconductor and metals. (8)
- b) Find the conductivity of Silicon
- i) Under intrinsic condition at 300°k
- ii) With donor impurity of 1 part in  $5 \times 10^7$ . Given that, intrinsic concentration  $(n_i) = 1.5 \times 10^{10}/\text{cm}^3$ , mobility of electron  $(\mu_n) = 1300 \text{ cm}^2/\text{v-s}$ , mobility of holes  $(\mu_p) = 500 \text{ cm}^2/\text{v-s}$ ,  $e = 1.6 \times 10^{-19} \text{ C}$  and no. of  $\text{Si}$  atoms  $= 5 \times 10^{22}/\text{cm}^3$  at a temperature of 27°C. (8)

**OR**

1. a) What are the step graded and continuously graded semiconductor? Explain. (8)
- b) Explain hall-effect and derive mathematical expression for hall-Coefficient, also describe its application. (8)

## Unit - II

2. a) Draw the output wave for of the following circuit (8)



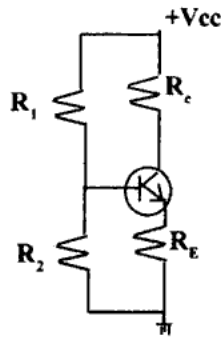
- b) Explain the working principle of UJT. Also explain why UJT has a negative resistance region? (8)

OR

2. a) A full wave rectifier uses diode with forward resistance of  $6\Omega$ . The transformer secondary is centre tap with output 10-0-10 r.m.s and has resistance of  $8\Omega$  of each half section. Calculate (8)
- Percentage regulation at 0.1 A
  - Power conversion efficiency
  - Ripple voltage across load
  - PIV of each diode.
- b) Write short notes on:-
- Schottky diode
  - Voltage multiplier. (8)

## Unit - III

3. a) Draw with circuit diagram of transistor common base configuration input and output characteristics. Also indicate the active, saturation and cut-off region. (8)
- b) Determine the value of  $R_1$  and  $R_2$  for the given circuit. Given that  $V_{CC}=24V$ ,  $R_C=330\Omega$ ,  $R_E=130\Omega$ ,  $V_{BE}=0.3V$ ,  $I_C=20mA$ ,  $\alpha=0.99$  and stability factor  $S=10$ . (8)



OR

3. a) Deduce expression for  $A_i, A_v, R_i, R_o$  and  $A$  is in a common collector BJT transistor amplifier in term of  $h$ -parameters. (8)
- b) Explain the significance of current gain  $\alpha$  and  $\beta$  in a transistor using various current component. (8)

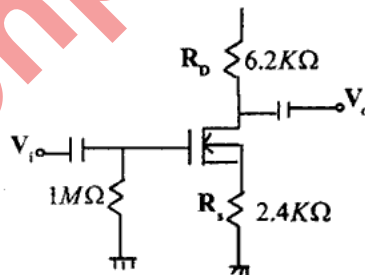
Unit - IV

4. a) Describe the carrier transportation in N-channel depletion type MOSFET using suitable diagram and also explain its drain transfer characteristics. (8)
- b) For the given network  $I_{DSS} = 8\text{mA}$  and  $V_p = -8\text{ volts}$ .  $V_{DD} = +20\text{V}$   
Determine the following

i)  $I_{DQ}$

ii)  $V_{GSQ}$

iii)  $V_D$

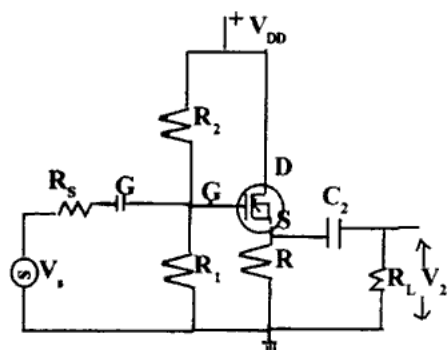


(8)

OR

4. a) Describe briefly the construction of N-channel JFET. Also define pinch off voltage. Draw its characteristics (8)
- b) For the given figure, find out the values of  $R_i$  and  $R_o$

Given that  $g_{mo} = 12.5\text{ mho}$ ,  $R_s = 5\text{k}\Omega$ ,  $R_2 = \alpha$ ,  $R_1 = 1\text{m}\Omega$ ,  $R = 50\Omega$ ,  $R_L = 10\text{k}\Omega$  and  $V_{DD} = 15\text{V}$



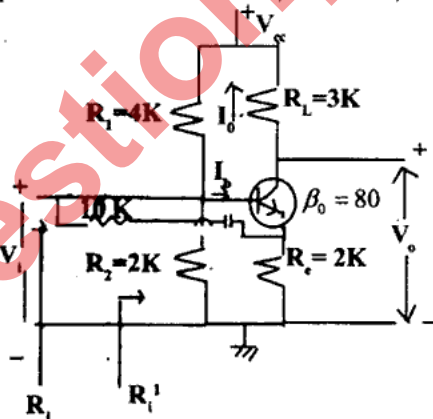
The transfer characteristic is given by  $I_D = 12.5 \left( 1 + \frac{V_{gs}}{2} \right)^2 \text{ mA}$  (8)

### Unit - V

5. a) In 2-stage RC coupled BJT amplifier deduce midband gain, Low frequency gain and high frequency gain in terms of circuit component. (8)
- b) D.c amplifier has a voltage gain of 40dB when ambient temperature increase from 25 to 50°C. The output changes by 0.25 volts. What is the drift of the amplifier referred to input? rtuonline.com (8)

OR

5. a) For the bootstrap circuit shown in the fig. Calculate  $A_i$ ;  $R_i$  and  $A_v$  The transistor parameters are  $h_{ie}=2K$ ,  $h_{fe}=100$ ,  $1/h_{oe}=40K$ ,  $h_{re}=2.5 \times 10^{-4}$ . (10)



- b) Write short notes on following
  - i) Boot strapping
  - ii) Miller's theorem.

(6)