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06ELN15/25

**First/Second Semester B.E. Degree Examination, December 2010**

**Basic Electronics**

Time: 3 hrs.

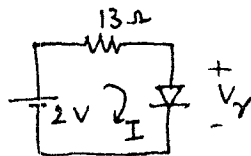
Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two questions from each part.  
 2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.  
 3. Answer to objective type questions on sheets other than OMR will not be valued.

**PART - A**

1 a. Select the right answer :

- i) What kind of a device is a diode?  
 A) Bilateral                      B) Linear                      C) Nonlinear                      D) Unipolar
- ii) How is nonconducting diode biased?  
 A) Forward                      B) Reverse                      C) Poorly                      D) None of these
- iii) What is the value of the current (I) in the circuit shown in Fig.Q1(a)(iii)?  
 Given  $V_r = 0.7$  V.



- A) 0.5 A                      B) 0.4 A
- C) 0.1 A                      D) None of these

Fig.Q1(a)(iii)

- iv) If the line frequency is 60 Hz, the output frequency of a half wave rectifier is  
 A) 30 Hz                      B) 60 Hz                      C) 120 Hz                      D) 0 Hz                      (04 Marks)
- b. For a typical P.N junction diode, define the terms : i) Knee voltage and ii) Reverse saturation current. Also indicate them on a typical V-I characteristic curve.                      (04 Marks)
- c. Design a zener voltage regulator to meet the following specifications:  
 Output voltage = 5 V                      load current = 10 mA  
 zener wattage = 100 mW                      input voltage = 10 V  $\pm$  2 V.                      (04 Marks)
- d. Derive an expression for ripple factor and output dc voltage, in case of a full wave rectifier with a capacitor filter.                      (08 Marks)

2 a. Select the right answer :

- i) In a CE configuration circuit, if the base resistor is open the Q point will be :  
 A) In the middle of the load line                      B) At the upper end of the load line  
 C) At the lower end of the load line                      D) OFF the load line.
- ii) In a BJT the collector current is 10 mA, if the current gain is 100, the base current is  
 A) 1  $\mu$ A                      B) 10  $\mu$ A                      C) 100  $\mu$ A                      D) 1 mA
- iii) Find the collector current in the circuit shown in Fig.Q2(a)(iii)

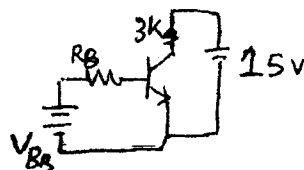


Fig.Q2(a)(iii)

- A) 2 mA
- B) 3 mA
- C) 10 mA
- D) None of these

iv) 'α' and 'β' in a BJT are connected by the equation

- A)  $\alpha = \frac{\beta}{1-\beta}$                       B)  $\beta = \frac{\alpha}{1-\alpha}$                       C)  $\alpha = \frac{\beta}{1+\beta}$                       D) Both B and C

(04 Marks)

Important Note : 1. On completing your answers, carefully draw diagonal cross lines on the remaining blank space.  
 2. Any revealing of identification, application to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

- 2 b. For the CE circuit shown below in Fig.Q2(b), draw the DC load line and mark the dc operating point in the active region. Indicate respective  $V_{CEQ}$  and  $I_{CQ}$  values. Given  $\beta = 100$  and neglect  $V_{BE}$ . (06 Marks)

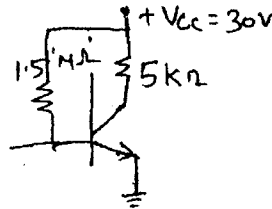


Fig.Q2(b)

- c. Explain the input and output characteristics for a CE configuration BJT circuit. Discuss each region on the characteristics. (06 Marks)
- d. Compare various BJT circuit configurations. (04 Marks)
- 3 a. Select the right answer :
- Majority carriers in the emitter of pnp transistor are  
A) Holes                      B) Free electrons    C) Trivalent atoms    D) Pentavalent atoms
  - Voltage divider bias is noted for its  
A) Unstable collector voltage                      B) Varying emitter current  
C) Large base current                                      D) Stable Q point
  - In a PN junction a temperature change of  $10^{\circ}\text{C}$  results in \_\_\_\_\_ of reverse leakage current  
A) Doubling                      B) Tripling                      C) No change                      D) Both B and C
  - Thermal runaway in a BJT is a  
A) Useful phenomenon                                      B) Tolerable phenomenon  
C) Destruction phenomenon                                      D) Both A and B (04 Marks)
- b. Draw a voltage divider bias circuit and derive an expression for its stability factor. (08 Marks)
- c. A collector to base bias has  $V_{CC} = 15\text{ V}$ ,  $R_C = 5.6\text{ K}\Omega$ ,  $R_B = 82\text{ K}\Omega$  and  $V_{CE} = 5\text{ V}$ . Determine the transistor  $h_{fe}$  value. Assume a silicon transistor. (04 Marks)
- d. Explain thermal runaway in the case a BJT. (04 Marks)
- 4 a. Select the right answer :
- The minimum anode current that keeps a thyristor turned ON is called the  
A) Holding current                                      B) Break over current  
C) Trigger current                                      D) Latching current
  - Input impedance of JFET  
A) Approaches to zero                                      B) Approaches one  
C) Approaches to  $\infty$                                       D) Is impossible to predict
  - A unipolar transistor uses  
A) Both free electrons and holes                                      B) Only free electrons  
C) Only holes                                      D) Either one or the other but not both
  - JFET acts like a voltage controlled resistance in \_\_\_\_\_ region.  
A) Cut off                                      B) ohmic region                      C) Saturation                      D) None of these (04 Marks)
- b. Is continuous gate current necessary to switch the SCR ON? Justify. How the SCR is switched OFF? (04 Marks)
- c. Sketch the V-I characteristics of VJT, indicate each region and explain the shape of the characteristic curve. (06 Marks)
- d. Illustrate SCR as a controlled rectifier. (06 Marks)

## PART - B

- 5 a. Select the right answer :
- An oscillator always needs an amplifier with
    - Positive feedback
    - Negative feedback
    - Both A and B
    - An LC tank circuit
  - Overall voltage gain with negative feedback ( $A_{CL}$ ) in terms of open loop gain ( $A_{OL}$ ) and feedback factor ( $\beta$ ) are given by
    - $\frac{A_{OL}}{1+\beta A_{OL}}$
    - $\frac{A_{OL}}{1-\beta A_{OL}}$
    - $\frac{A_{OL}}{1\pm\beta A_{OL}}$
    - None of these
  - For high frequency oscillators normally \_\_\_\_\_ elements are used in the feedback circuit.
    - LC
    - RC
    - Either A or B
    - Both A and B
  - Frequency output of an RC phase shift oscillator is given by
    - $f = \frac{1}{2\pi RC}$
    - $f = \frac{1}{2\pi RC\sqrt{6}}$
    - $f = \frac{1}{2\pi\sqrt{LRC}}$
    - None of these
- (04 Marks)
- b. Draw the circuit of a two stage R-C coupled CE amplifier. Explain significance of each component. Plot its frequency response. (10 Marks)
- c. Discuss the effect of negative feedback on the bandwidth and voltage gain of an amplifier. (06 Marks)

- 6 a. Select the right answer :
- OPAMP voltage follower has a voltage gain of approximately
    - Unity
    - Zero
    - Infinity
    - None of these
  - Ideal OPAMP has a CMRR equal to
    - Zero
    - Infinity
    - Unity
    - None of these
  - If  $V_1$  and  $V_2$  are input voltages of a non inverting adder circuit, output voltage ( $V_0$ ) is given by
    - $(V_1 + V_2)$
    - $-(V_1 + V_2)$
    - $V_1 - V_2$
    - None of these
  - An OPAMP has a voltage gain of  $5 \times 10^5$ . If the output voltage is 1 V, the input voltage is
    - $2 \mu V$
    - 5 mV
    - 10 mV
    - 1 V
- (04 Marks)
- b. Write expressions for output voltage at points A, B, C, D and E in the circuit shown in Fig.Q6(b).

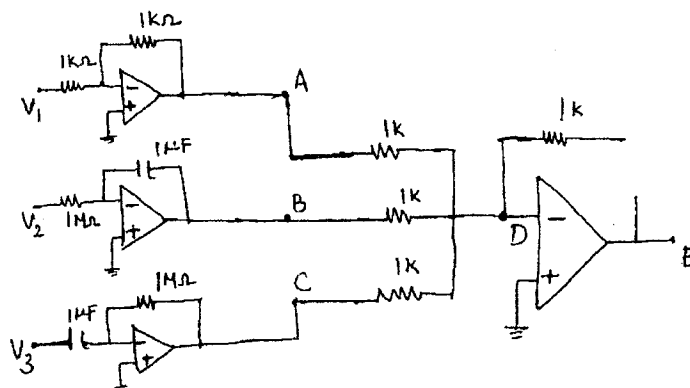


Fig.Q6(b)

- c. List some important characteristics of an ideal OPAMP.

(10 Marks)

(06 Marks)

- 7 a. Select the right answer :
- i)  $(ABCD)_{16} = ( \quad )_8$   
 A) 125715      B) 13715      C) 125710      D) None of these
  - ii) Relation between modulation index ( $m_a$ ), total modulated current ( $I_t$ ) and unmodulated ( $I_c$ ) current, in case of AM wave is given by  
 A)  $I_t = I_c \sqrt{1 + \frac{m_a^2}{2}}$       B)  $I_t = I_c \left(1 + \frac{m_a^2}{2}\right)$   
 C)  $I_c = I_t \sqrt{1 + \frac{m_a^2}{2}}$       D) None of these
  - iii) Term "IF" in an AM receiver refers to  
 A) Intermediate frequency      B) Introductory frequency  
 C) Interlock frequency      D) None of these
  - iv) Mixer is a building block of  
 A) AM receiver      B) FM receiver      C) AM transmitter      D) None of these
- (04 Marks)
- Obtain an expression for total average power of sinusoidal AM wave. (05 Marks)
- b. When the modulation percentage is 75%, an AM transmitter radiated 10 KW. How much of this is carrier power? (05 Marks)
- c. Draw the clock diagram of a super heterodyne receiver and explain the function of each stage. (06 Marks)

- 8 a. Select the right answer :
- i) Boolean expression for XNOR gate is  
 A)  $Y = \overline{A}B + \overline{B}A$       B)  $Y = \overline{A}B + AB$       C)  $Y = \overline{A}B + \overline{A}B$       D) None of these
  - ii) If two inputs of NAND gate are shorted and input is applied its output will be \_\_\_\_\_ of the input  
 A) complement      B) Double      C) No change      D) Both A and B
  - iii) Universal gates are  
 A) NAND and NOR      B) AND and OR      C) Both A and B      D) None of these
  - iv)  $\overline{\overline{A + B + 1}} = \underline{\hspace{2cm}}$   
 A) 0      B) 1      C)  $\overline{A + B + 1}$       D)  $\overline{A} \cdot \overline{B} \cdot \overline{1}$  (04 Marks)
- b. Simplify the following expression and implement using NAND gates only:  
 i)  $XYZ + YZ + \overline{Z}$       ii)  $\overline{A}B + \overline{B}A$  (06 Marks)
- c. Draw the output waveform (Y and Y') and also prepare a truth table for the circuit given below in Fig.Q8(c)(i) and (ii). (10 Marks)

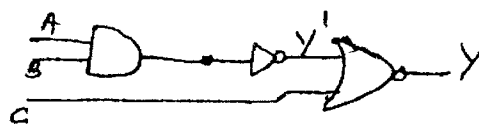


Fig.Q8(c)(i)

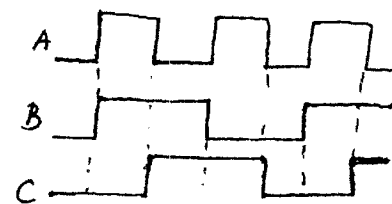


Fig.Q8(c)(ii)

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10ELN15

**First Semester B.E. Degree Examination, January 2011**  
**Basic Electronics**

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.  
2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.  
3. Answer to objective type questions on sheets other than OMR will not be valued.

**PART – A**

- 1 a. Choose the correct answer :
- i) The rms value of a load current in case of a half wave rectifier is  
A)  $\pi/2$                       B)  $I_m/2$                       C)  $I_m/\sqrt{2}$                       D)  $I_m/\pi$
  - ii) The peak inverse voltage of a FWR, with centre tap transformer is  
A)  $V_m$                       B)  $4\sqrt{V_s}$                       C)  $2V_m$                       D)  $2V_s$
  - iii) In a bridge rectifier, the input is from 230V, 50 Hz; the DC output voltage is  
A) 200V                      B) 207V                      C) 315V                      D) 220V
  - iv) The knee voltage of a Germanium diode is \_\_\_\_\_ volts  
A) 0.3V                      B) 0.5V                      C) 0.7V                      D) None of these  
(04 Marks)
- b. Discuss the performance of the zener diode, in terms of the source & load effects. (08 Marks)
- c. Draw the circuit of a bridge rectifier and explain its working. What is the use of the filter?  
(08 Marks)
- 2 a. Choose the correct answer :
- i) The transistor operating point is along the \_\_\_\_\_.  
A) X-axis                      B) Resistance line                      C) Load line                      D) Y-axis
  - ii) The \_\_\_\_\_ transistor is used for impedance matching.  
A) CB                      B) CE                      C) CC                      D) None of these.
  - iii) The \_\_\_\_\_ transistor has the highest power gain.  
A) CE                      B) CC                      C) CB                      D) None of these.
  - iv) In a transistor the current conduction is due to \_\_\_\_\_ carriers.  
A) Majority                      B) Minority                      C) Both A) and B)                      D) None of these.  
(04 Marks)
- b. Obtain the relation between the  $\alpha_{dc}$  and  $\beta_{dc}$ .  
(04 Marks)
- c. Draw and explain the input and output characteristics of a PNP transistor in common emitter configuration.  
(08 Marks)
- d. Given  $I_E = 2.5mA$ ,  $\alpha = 0.98$  and  $I_{CBO} = 10\mu A$ , calculate  $I_B$  and  $I_C$ .  
(04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, approval to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

3 a. Choose the correct answer :

i) The reverse saturation current doubles for every \_\_\_\_\_ °C rise in temperature.

- A) 40                      B) 45                      C) 10                      D) 30

ii) The intersection of DC load line and the output characteristics of a transistor is called

- A) Q-point              B) Quiescent point      C) Operating point      D) All of these.

iii) For an emitter follower, the voltage gain is \_\_\_\_\_.

- A) unity                  B) greater than unity      C) less than unity      D) zero.

iv) The operating point must be \_\_\_\_\_ for the proper operation of the transistor.

- A) High                  B) Stable                  C) Increasing              D) Decreasing (04 Marks)

b. Explain the circuit operation and analysis of voltage divider bias. (08 Marks)

c. Design the collector to base bias circuit for Fig.Q3(c). Given  $V_{CC} = 20V$ ,  $V_{CE} = 5V$ ,  $I_C = 6 mA$ ,  $h_{fe} = 100$ . (04 Marks)

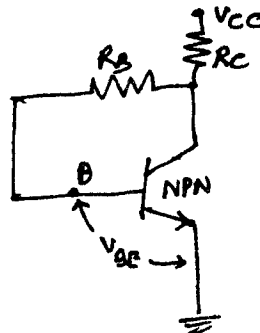


Fig.Q3(c)

d. Explain the DC load line and operating point, with example, related to the transistor. (04 Marks)

4 a. Choose the correct answer :

i) A SCR has \_\_\_\_\_ number of junctions.

- A) one                      B) two                      C) three                      D) four

ii) The FET is a \_\_\_\_\_ controlled device.

- A) voltage                  B) current                  C) power                  D) None of these

iii) The holding current in a SCR is \_\_\_\_\_ than the latching current.

- A) more                      B) less                      C) equal                      D) None of these

iv) A relaxation oscillator uses

- A) MOSFET                  B) SCR                      C) UJT                      D) BJT (04 Marks)

b. Sketch and explain the V-I characteristics of SCR. (04 Marks)

c. Explain the P-channel JFET drain characteristics. (04 Marks)

d. Explain the JFET as an amplifier. (08 Marks)

**PART – B**

- 5 a. Choose the correct answer :
- In a mid frequency band, the voltage gain is \_\_\_\_\_.  
A) increasing      B) decreasing      C) constant      D) None of these.
  - A crystal oscillator finds use, when the \_\_\_\_\_ stability is required.  
A) amplitude      B) frequency      C) phase      D) None of these.
  - The Colpitt's oscillator is \_\_\_\_\_.  
A) Audio oscillator      B) Radio oscillator      C) Microwave oscillator      D) None of these.
  - In an oscillator, we use \_\_\_\_\_ feedback.  
A) positive      B) negative      C) unity gain      D) None of these. (04 Marks)
- b. With the help of a neat circuit diagram, explain the function of every component in an RC coupled amplifier. (08 Marks)
- c. Draw and explain the RC phase shift oscillator. (04 Marks)
- d. Calculate the frequency of oscillations of a Hartley oscillator, having  $L_1 = 0.5 \text{ mH}$ ,  $L_2 = 1 \text{ mH}$  and  $C = 0.2 \text{ }\mu\text{F}$ . (04 Marks)
- 6 a. Choose the correct answer :
- The op - Amp can amplify  
A) AC signal only      B) DC signal only      C) Both AC and DC signals      D) None of these.
  - An op Amp has \_\_\_\_\_ output impedance.  
A)  $\infty$       B) 0      C)  $10,000 \text{ }\Omega$       D)  $600 \text{ }\Omega$
  - CMRR should be  
A) unity      B) zero      C) much larger than unity      D) much smaller than unity
  - The inverting amplifier circuit has  $R_i = 1 \text{ k}\Omega$  and  $R_f = 3 \text{ k}\Omega$ . The output voltage is \_\_\_\_\_ when  $v_i = 4\text{V}$ .  
A) 6V      B) 16V      C) 12V      D) 18V (04 Marks)
- b. Explain the term op-Amp. List the characteristics of an ideal op-Amp. (08 Marks)
- c. Explain clearly how op-Amp can be used as the following type of amplifier:  
i) summer      ii) integrator      iii) differentiator      iv) inverting (08 Marks)
- 7 a. Choose the correct answer :
- The circuit that recovers the original modulating information from an AM signal is known as \_\_\_\_\_.  
A) Modulator      B) Mixer      C) Demodulator      D) Oscillator.
  - The binary equivalent of decimal number 6 is  
A) 100      B) 011      C) 110      D) 1001

iii)  $(ABC)_{16} = (?)_{10}$

A) 3000

B) 4230

C) 2748

D) 2250

iv)  $(11011)_2 = (?)_8$

A)  $(33)_8$ B)  $(17)_8$ C)  $(25)_8$ D)  $(28)_8$ 

(04 Marks)

b. Explain the need for modulation.

(04 Marks)

c. Draw the block diagram of super-heterodyne AM receiver. Explain the function of each block.

(08 Marks)

d. Write the decimal equivalent of  $(10AB)_{16}$ .

(04 Marks)

8 a. Choose the correct answer :

i)  $A + AB =$  \_\_\_\_\_

A) AB

B) A

C) B

D)  $1 + A$ 

ii) The output is high only when both the inputs are zero to a gate. The gate is

A) AND

B) NOR

C) OR

D) NAND

iii) The complement of  $A+B+1$  is

A) 0

B)  $A+\overline{B+1}$ C)  $\overline{AB+1}$ 

D) 1

iv) Universal gate is \_\_\_\_\_

A) NOT

B) AND

C) OR

D) NAND

(04 Marks)

b. Draw the full adder circuit, with the truth table.

(08 Marks)

c. Explain the logic circuit of XOR gate with the truth table.

(04 Marks)

d. Realize the following expression using the NOR gate.

$$Y = A (\overline{B} + C)$$

(04 Marks)

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