First/Second Semester B.E. Degree Examination, January 2013
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 answers for the following :   **(04 Marks)**
     i)   The Depletion layer in a pn junction contains
         A) Electron   B) Holes
         C) Electrons and holes   D) Ions
     ii)   The turn on voltage of a Si Diode is nearly
         A) 0.7 volts   B) 0.3 volts   C) 1 volt   D) 0.1 volts
     iii) Once a Zener diode goes into break down the parameter which does not change much is
         A) Current   B) Resistance   C) Voltage   D) Capacitance
     iv)   If f Hz is the frequency of the input given to a fullwave rectifier, the output frequency will be
         A) f Hz   B) 2f Hz   C) 3f Hz   D) 4f Hz

   b.   With a neat diagram, explain the process of formation of depletion layer in a pn junction.   **(04 Marks)**

   c.   The incremental change in the voltage and the current is found to be 0.19V and 37.6 mA respectively from the forward characteristics of the diode. Determine the ac resistance of the junction.   **(04 Marks)**

   d.   A single phase half wave rectifier supplies power to a 1 KΩ load. The inpue voltage is 200 volt rms. Neglecting forward resistance of the diode, calculate:
     i) V_{dc} ;   ii) V_{rms} ;   iii) I_{dc} ;   iv) Ripple voltage (rms calue).   **(08 Marks)**

2   a.   Choose the correct answers for the following: **(04 Marks)**
     i)   The current amplification factor α_{dc} of a transistor is given by
         A) I_C/I_E B) I_C/I_B C) I_E/I_B D) I_B/I_E
     ii)   In the following relationships between α and β, one of the expression is wrong
         A) $\beta = \dfrac{\alpha}{1-\alpha}$ B) $\alpha = \dfrac{\beta}{1-\beta}$ C) $\alpha = \dfrac{\beta}{1+\beta}$ D) $1-\alpha = \dfrac{1}{1+\beta}$
     iii) For a transistor to function as a normal amplifier
         A) EB junction is reverse biased and CB junction is forward biased.
         B) EB junction is forward biased and CB junction is forward biased.
         C) CB junction is reverse biased and EB junction is reverse biased.
         D) CB junction is reverse biased and EB junction is forward biased.
     iv) β_{dc} of a transistor is
         A) Equal to α_{dc} B) Less than α_{dc}
         C) Greater then α_{dc} D) None of the above

b. Draw the symbols of a pnp and an npn transistors. Which of the transistor current is always the largest? Which is always the smallest? Which two currents are relatively close in magnitude? **(05 Marks)**

c. Explain the working of a transistor amplifier in the CE configuration. Draw its output characteristics and mark the three regions of operation on the characteristics. **(06 Marks)**

d. Determine β_{dc}, I_E and α_{dc} for a transistor where $I_B = 50\mu A$ and $I_C = 5mA$. Neglect I_{CBO}. **(05 Marks)**

3 a. Choose the correct answers for the following: **(04 Marks)**
   i) The best location of the Q-point for a transistor is
      A) At the bottom of the dc load line   B) At the top of dc load line
      C) At the centre of the dc load line   D) Outside the dc load line
   ii) The dc load line of a transistor circuit
      A) has a positive slope
      B) does not contain the Q-point
      C) has a negative slope
      D) gives graphic relationship between I_C and I_B
   iii) The early effect in a bipolar junction transistor is caused by
      A) Fast turn on   B) Fast turn off
      C) Large collector base reverse bias   D) Large emitter base forward bias
   iv) A BJT is said to be in saturation region if
      A) both junctions are reverse biased
      B) EB junction is reverse biased and CB junction is forward biased
      C) EB junction is forward biased and CB junction is reverse biased
      D) both junctions are forward biased

b. Define bearing of a transistor. Explain with a neat circuit diagram the operation of a collector to base bias circuit. What is the advantage of this circuit over a fixed bias circuit? **(08 Marks)**

c. Given that $I_{CQ} = 2mA$ and $V_{CEQ} = 10V$. Determine R_1 and R_C for the network shown. $V_{BE} = 0.7V$. **(08 Marks)**
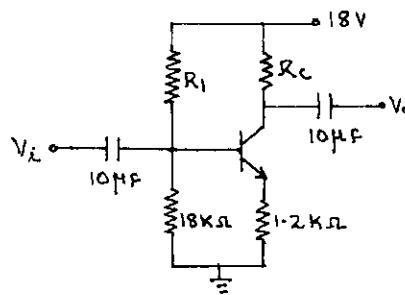

Fig.Q.3(c)

4 a. Choose the correct answers for the following : **(04 Marks)**
   i) The latching current in a SCR
      A) is less than holding current   B) is greater than holding current
      C) is equal to the holding current   D) None of the above
   ii) Which of the device mentioned acts like a diode and two resistors
      A) SCR   B) TRIAC   C) DIAC   D) UJT
   iii) A FET consists of
      A) Source   B) Drain   C) Gate   D) All the above
   iv) Which of the following is a unipolar device
      A) Diode   B) BJT   C) SCR   D) FET

b. Draw the symbol and the equivalent circuit of UJT. Using the equivalent circuit explain the working of UJT and draw its characteristics marking the various regions on it. **(08 Marks)**

c. Explain the working of a SCR using two transistor model and obtain the expression for the anode current. **(08 Marks)**

PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**

   i) The gain of a cascaded amplifier is
     A) Sum of the voltage gains of all the stages
     B) difference of the voltage gains of all stages
     C) Products of the voltage gains of all stages
     D) None of the above

   ii) The frequency of oscillations in an oscillator is given by

     A) $\dfrac{1}{2\pi LC}$ B) $2\pi LC$ C) $2\pi\sqrt{LC}$ D) $\dfrac{1}{2\pi\sqrt{LC}}$

   iii) An oscillator is
     A) like an alternator   B) an amplifier
     C) an amplifier with positive feedback   D) a rectifier

   iv) For a Colpilt's oscillator $C_1 = 0.01~\mu F$, $C_2 = 0.001\mu F$ and $L = 15\mu H$. Its operating frequency is
     A) 1362 kHz   B) 1500 kHz   C) 100 Hz   D) 2651 kHz

b. Draw and explain a typical frequency response curve of a RC coupled amplifier clearly indicate the various regions in it. **(06 Marks)**

c. List out the advantages of negative feed back. **(04 Marks)**

d. A Hartley oscillator is designed with $L_1 = 20\mu H$ and $L_2 = 2mH$ and a variable capacitor. Determine the range of capacitance values, if the frequency of oscillation is varied between 1 MHz to 2.5 MHz. Neglect mutual inductance. **(06 Marks)**

6 a. Choose the correct answers for the following : **(04 Marks)**

   i) An Op-Amp
     A) amplifies the sum of the two signals applied across its terminals
     B) amplifies the product of the two signals applied across its terminals
     C) amplifies the difference of the two signals applied across its terminals
     D) None of the above

   ii) An ideal Op-Amp has
     A) infinite A_v B) infinite R_i C) zero R_o D) All the above

   iii) An inverting amplifier has $R_F = 2M\Omega$ and $R_1 = 2K\Omega$. Its scale factor is
     A) 1000   B) -1000   C) 10^{-3} D) -10^{-3}

   iv) CMRR of an Op-Amp is given by

     A) $|A_d||A_c|$ B) $|A_d|+|A_c|$

     C) $\dfrac{|A_d|}{|A_c|}$ D) $|A_d|-|A_c|$

b. Draw the equivalent circuit of an Op-Amp. **(04 Marks)**

c. Draw the circuit of an Op-Amp as a non-inverting summer and device an expression for output voltage. **(06 Marks)**

d. Draw the basic structure of a cathode ray tube and explain its working. **(06 Marks)**

7 a. Choose the correct answers for the following :   (04 Marks)
       i) The main purpose of modulation is to
           A) Combine two waves of different frequencies
           B) achieve wave shaping of the carrier wave
           C) transmit low frequency information over long distances efficiently
           D) produce side bands
       ii) In amplitude modulation
           A) Carrier frequency is changed   B) Carrier amplitude is changed
           C) Three side bands are produced   D) Fidelity is improved
       iii) The binary addition of 1+1+1 gives
           A) 111   B) 10   C) 110   D) 11
       iv) The binary equivalent of $(A)_{16}$ is
           A) 1010   B) 1011   C) 1100   D) 1110
   b. What are the basic components of a communication system? Draw and explain the block
       diagram of a typical communication system.   (06 Marks)
   c. If the radiated power of an AM transmitter is 10kW, determine the power in the carrier for a
       modulation index of 0.6.   (04 Marks)
   d. Perform the following subtraction using 2's complement i) 78-65 ; ii) 708-648.   (06 Marks)

8 a. Choose the correct answers for the following :   (04 Marks)
       i) The output of a 2 input OR gate is zero only when
           A) both inputs are zero   B) either input is one
           C) both inputs are one   D) either input is zero
       ii) A NOR gate is ON only when all its inputs are
           A) ON   B) Positive   C) High   D) Zero
       iii) ABCD + ABD is equal to
           A) ABC   B) $\overline{ABC}$ C) $\overline{ABD}$ D) ABD
       iv) A (A + B) is equal to
           A) B   B) AB   C) $\overline{AB}$ D) A
   b. Determine the output of the logic circuit shown in the figure   (04 Marks)

Fig.Q.8(b)

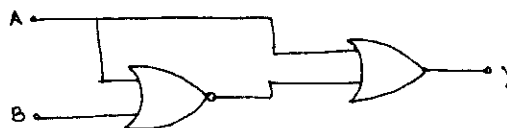   c. Simplify the following:
       i) $\overline{AB} + \overline{A} + AB$
       ii) AB + A(B + C) + B(B + C)   (06 Marks)
   d. Reduce the Boolean expression
       $Y = \overline{ABCD} + BC\overline{D} + B\overline{CD} + BCD$
       and implement it using logic gates.   (06 Marks)

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