Unit – III

5. a) Sketch and explain the frequency response of RC coupled amplifier. Discuss the effec negative feedback on bandwidth of an amplifier.
   b) Discuss the phase reversal operation of single stage common emitter amplifier with ci diagram and waveforms.
   c) An amplifier is having a midband gain of 40 dB. If the input signal is 20 mV, find t absolute value of output voltage. What will be the dB gain at cutoff frequencies?

6. a) With the help of neat circuit diagram, explain the operation of Hartley oscillator. Give th equation for frequency of oscillations.
   b) Discuss the concept of positive feedback with the help of block diagram and state the Barkhausen criterion.
   c) In an oscillator, $C_1 = C_2 = C$ and $L = 50\ \mu H$. The frequency of oscillations is 700 KHz. Determine the value of C. Calculate feedback factor and gain.

Unit – IV

7. a) Sketch the circuit for two input inverting summing amplifier, derive an equation for output voltage.
   b) Draw the circuit diagram for non-inverting op-amp amplifier, explain the amplifier operation and derive the closed loop voltage gain equation. Draw the modification in the circuit to operate as voltage follower.
   c) A sinusoidal signal with peak value 6 mV and 2 kHz frequency is applied to the input of an ideal inverting op-amp amplifier with $R_1 = 10$ kΩ. Calculate the value of R_f to obtain output sine wave of peak magnitude 60 mV. Show the circuit with values.

8. a) With the help of neat diagram describe the constructional feature of CRT.
   b) Why modulation is necessary? With sketches of waveforms describe the principle of amplitude modulation?
   c) Determine the gain and output voltage for a noninverting amplifier using op-amp,when the input voltage is(i)0.5V (ii)-3V.Assume supply voltage employed is ±12V, R_f = 10 KΩ, R_1=1KΩ

Unit – V

9. a) Convert the following .
   (i) $(285.25)_{10} = (\ ?\ )_2$
   (ii) $(934)_{10} = (\ ?\ )_8$
   (iii) $(11011011110)_2 = (\ ?\ )_8$ 06
   b) Obtain the following
   (i) $(ABC.D)_{16} = (\ ?\ )_{10}$
   (ii) $(78531)_{10} = (\ ?\ )_{16}$
   (iii) $(0.625)_{10} = (\ ?\ )_2$ 06
   c) Give function table and expressions for **SUM** and **CARRY** for HALF ADDER. Implement using basic gates. 08

10. a) (i) Using **2's** complement , obtain **(10011) — (11011)**
    (ii) Get the decimal equivalent of $(B8E.D)_{16}$ 06
    b) Show the truth table and realize the function , $Y = (A+B).(\bar{A}+C).(B+\bar{C})$ using basic gates.
    c) How many inputs are given to a FULL ADDER and what are they ? Show the function table and give a realization using half adders.

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester B.E. (Credit System) Degree Examinations

Make up Examinations - January 2015

ion: 3 Hours

14EC112 – BASIC ELECTRONICS

Max. Marks: 100

*Note: Answer **Five** full questions choosing **One** full question from **each Unit.***

Unit – I

a) Sketch the piecewise linear approximation of forward V-I characteristic of a silicon diode, mark the relevant parameters and explain. Draw the electrical equivalent circuit. 07

b) Draw the circuit of a half wave diode rectifier, sketch wave forms of input a.c. voltage and load current and explain the operation. Derive expressions for average d.c.load voltage and d.c. power in load , considering diode to be ideal . 07

c) The input a.c. voltage to a half wave diode rectifier is **24 volts (rms) , 50 Hz.** and the load resistance is **500 Ω** . Considering diode forward conducting resistance, R_F=**10 Ω** , calculate (i) average load current (ii) d.c. power in load and (iii) % load voltage regulation 06

a) Discuss the operation of full wave rectifier using two diodes, with circuit diagram and wave forms of input a.c. voltage and load current . Considering diodes to have forward conducting resistance of, R_F, derive expressions for average d.c. load voltage and rms load voltage. 08

b) Explain the different reverse breakdown phenomena in diodes . 06

c) An unloaded Zener voltage regulator is connected in series with a resistance of **100 Ω** across a d.c. supply . The Zener has V_Z = **10 volts** , I_{ZK} = **10 mA** and $I_{Z\,max}$ = **100 mA**. Calculate (i) minimum value of input d.c. supply voltage and (ii) maximum value of input d.c. supply voltage . 06

Unit – II

a) Express in terms of transistor currents, the parameters, α_{dc} and β_{dc} . For a transistor to work as a good amplifier, are these to be low or high? Draw the symbol of a NPN transistor and indicate directions of currents. Derive expression for α_{dc} in terms of β_{dc} . A particular transistor has β_{dc} = **100** and collector current of **100 mA** . What value of base current is required for this condition ? 08

b) With a circuit diagram of NPN transistor in common emitter configuration, sketch input and output characteristics. Also mark different regions of operation on output characteristics. What form of operation of transistor is represented by each region? 08

c) Draw the symbol of SCR and sketch forward and reverse **V – I** characteristics of this device for different gate currents with markings of forward and reverse breakover voltages and conducting region . 04

a) Why is it necessary to provide a quiescent base and collector current for a transistor to operate as amplifier satisfactorily? In order to have maximum symmetrical output swing of amplified input signal, what is the desirable value of V_{ce} , the collector emitter voltage, in terms of collector circuit supply voltage? Show the base (fixed) bias circuit for NPN transistor in CE configuration with direction of currents and polarities of voltages marked . 08

b) A NPN transistor connected in common emitter configuration has a collector circuit supply of **15 volts** and collector resistance , R_c = **500 Ω** . Draw the load line to scale. Mark the desirable quiescent operating point for maximum symmetrical output swing showing the values of V_{ce} and I_c . 06

c) Draw circuit diagram of pulse firing circuit for half wave controlled rectifier using SCR. Sketch wave forms of input a.c. supply, gate current pulse and output load voltage for some firing angle. 06

P.T.O.

14EC112

4. a) Explain the input and output characteristics of common base configuration for NPN transistor with neat circuit diagram and mark the regions of operation on output characteristics. 8

b) A NPN silicon transistor in common emitter configuration has collector circuit dc supply of 24V. If collector circuit resistance R_c=1KΩ, calculate quiescent collector current, I_c and quiescent base current, I_B such that the circuit as a voltage amplifier can produce maximum symmetrical output swing. Assume β of the transistor as 60. 6

c) Explain the operation of heater control circuit using SCR with a neat circuit diagram 6

Unit – III

5. a) Draw the block diagram of a series voltage negative feedback amplifier and derive expression for closed loop gain. 8

b) List the advantages of negative feedback. 6

c) Three amplifier stages are working in cascade with 0.05V peak-to-peak input providing 150V peak-to-peak output. If the absolute voltage gain of the first stage is 30 and input to the third stage is $15V_{pp}$,find 6

i) The absolute voltage gain of the third stage ii) Overall decibel voltage gain.

6. a) Define oscillator. Explain the basic principle of sinusoidal oscillators using a block diagram and state Barkhausen criterion for sustained oscillations. 8

b) In a Hartley oscillator L_1=5mH, L_2=10mH, C=0.01μF. Calculate frequency of oscillations, feedback factor and gain required for sustained oscillations. 6

c) Explain the operation of RC phase shift oscillator with the help of circuit diagram. Give the equation for frequency of oscillations. 6

Unit – IV

7. a) Show the circuit of an inverting OPAMP differentiator. Derive expression for output voltage 8

b) With a block diagram, explain the operation of a Cathode Ray Oscilloscope 6

c) An OPAMP noninverting amplifier has **R_1=2KΩ**, **Vin= +12V** and **Vout= +13V**. Power supply=**±15V**. Determine the value of feedback resistor, **R2**. Show the circuit diagram with values. 6

8. a) With a circuit diagram, derive expression for output voltage of an inverting OPAMP amplifier. 8

b) With waveforms, explain amplitude modulation. 6

c) Feedback resistor, **R_f** in an inverting adder is **10 KΩ**. Two inputs of **V_1** and **V_2** of **+6** volts and **+12** volts are to give an output of **— 12** volts. If **R_1**, resistor in series with **V_1** is **10 KΩ**, determine value of resistor **R_2** to be connected in series with the other input . 6

Unit – V

9. a) Convert the following:- 6

(i) $(934)_{10}$=(?)8 (ii) $(8899)_{10}$=(?)16 (iii) $(63)_{10}$=(?)2

b) (i) Obtain $(11010)_2$ — $(1101)_2$ using 2's complement. 6

(ii) Obtain $(1010)_2$ + $(11111)_2$

c) Discuss the operation of a binary half adder with expressions and truth tables for outputs and show the realization using basic gates 8

10. a) Convert the following:- 6

(i) $(110111101.01)_2$=(?)8

(ii) $(0.705)_{10}$=(?)8

(iii) $(11101.01)_2$=(?)10

b) (i) Obtain $(11010)_2$ — $(101)_2$ using 2's complement.

(ii) Realize using basic gates $Y = AB\bar{C} + \bar{A}BC + \bar{B}C$ 6

c) What is a full adder? With a block diagram and truth table explain operation. Show implementation using half adders. 8

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester B.E. (Credit System) Degree Examinations

April - May 2015

14EC112 – BASIC ELECTRONICS

3 Hours

Max. Marks: 100

*Note: Answer **Five** full questions choosing **One** full question from **each Unit.***

Unit – I

Derive expressions for average load current, RMS load current and rectification efficiency of half wave diode rectifier. 10

Sketch the typical forward and reverse characteristics of Silicon diode and mark the important parameters. 5

In a full wave rectifier the input is from a 30-0-30 V transformer. The load and diode forward resistances are 100Ω and 10Ω respectively. Calculate the average output voltage and rectification efficiency. 5

Draw the circuit of a full wave rectifier with capacitor filter. Explain its principle of working with relevant waveforms and derive an expression for ripple factor. 10

Discuss the types of junction breakdown that occur in reverse biased diodes. 5

A 24V zener diode is used for providing a 24V regulated DC supply to a resistive load. If the input voltage is 32V and resistance in series with dc input supply is 150Ω, calculate the current in zener when the load is 1200Ω. Draw the circuit diagram marking all component voltage and current values. 5

Unit – II

With circuit diagram of NPN silicon transistor in common emitter configuration, sketch and explain input and output characteristics. Mark different regions of operation. 8

A [illegible] bias circuit has V_{cc}=22V, R_c=6.8KΩ and Silicon NPN transistor has β=100. Calculate the required base resistance value to give V_{CE}=5V. Draw the circuit diagram indicating all the values. 6

In the circuit shown in fig.3(b), I_C=12mA, V_{CE}=8V. A silicon transistor is used with β=120. Find the values of R_B and R_C.

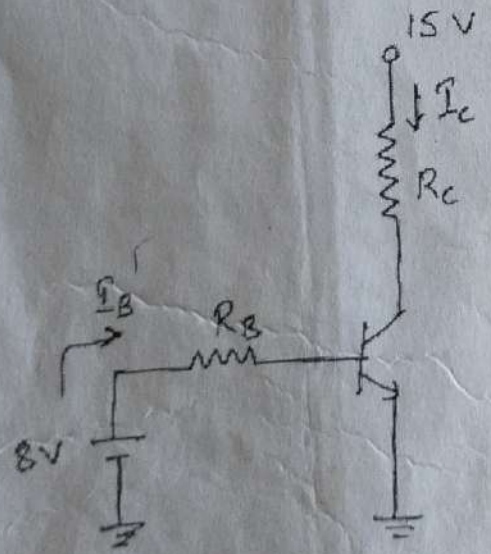

fig 3(b) 6

P.T.O.

Unit – III

5. a) Bring out the significance of each component in a common emitter RC coupled amplifier with the help of neat circuit diagram. 10

b) An amplifier has a bandwidth of 500 KHz. If the lower cutoff frequency is 1KHz, what is the upper cutoff frequency? Also find the voltage gain at the lower cutoff frequency, if the midband voltage gain is 120. 04

c) Sketch and explain the frequency response of RC coupled amplifier. 06

6. a) Discuss the concept of positive feedback with the help of block diagram and state the Barkhausen criterion. 08

b) A Hartley oscillator circuit has tank circuit inductance of $L_1 = L_2 = 100\mu H$. It is required to design an oscillator to produce a frequency of 1 MHz Show the oscillator circuit and obtain the value of C connected across the combination of L_1 and L_2. 04

c) Discuss the operation of RC phase shift oscillator with circuit diagram. Also give the formula for frequency of oscillations. 08

Unit – IV

7. a) Sketch a circuit for inverting op-amp amplifier, explain the amplifier operation and derive the closed loop voltage gain equation. 08

b) Show with derivation and circuit diagram how op-amp can be used as integrator? 08

c) For a noninverting op-amp amplifier gain required is 61. Determine the value of feedback resistor Rf. Consider R1=1KΩ. Show the circuit with values. 04

8. a) Draw the basic structure of cathode ray tube, identify different components and describe each component. 08

b) With the help of block schematic describe a basic communication system. 06

c) A sine wave of I Volt peak to peak voltage is applied to an inverting amplifier using R_1=10KΩ and R_f=50KΩ, it uses a supply voltage of ±12V. Determine the output. If now the amplitude of input sine wave is increased to 5V, what will be the output? 06

Unit – V

9. a) Obtain the following.
   (i) $(345.75)_{10} = (?)_2$
   (ii) $(100111000)_2 = (?)_8$
   (iii) $(2BD.AC)_{16} = (?)_{10}$ 06

b) (i) Using 2's complement, perform $(100101) - (100110)$
(ii) Give the truth table and symbol for 2 input OR and AND gate. 06

c) Explain addition of binaries using Half Adder with function table. Show realization of this Half Adder using basic gates. 08

10. a) Convert the following.
   (i) $(355.875)_{10} = (?)_8$
   (ii) $(1A6.3D)_{16} = (?)_{10}$
   (iii) $(2006)_{10} = (?)_{16}$ 06

b) (i) Implement using basic gates, $Y = A\bar{C} + A.B + C\bar{B}$
(ii) Add $(110011) + (100110) + (110001)$ 06

c) (i) Show the truth table of EX – OR gate and realize the same using basic gates.
(ii) With symbol and truth table, describe any two basic gates. 08

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INSTITUTE OF TECHNOLOGY, NITTE
(An Autonomous Institution affiliated to VTU, Belagavi)
First / Second Semester B.E. (Credit System) Degree Examinations
Make up / Supplementary Examinations - July 2015
14EC112 – BASIC ELECTRONICS

tion: 3 Hours

Max. Marks: 100

*Note: Answer **Five** full questions choosing **One** full question from **each Unit.***

Unit – I

a) Define " cut in voltage " , " incremental a.c. resistance (" dynamic forward resistance ") and " reverse breakover voltage " ("peak inverse voltage ") of a diode. Show a sketch with markings of above. 08

b) With a circuit diagram, explain the operation of a diode bridge rectifier. Show the wave forms of input a.c. voltage and load current. Derive the expressions of d.c. average load voltage and d.c. average load current assuming diodes to have forward conducting resistance, R_F. 08

c) A silicon diode and a germanium diode are connected in series with a load resistance of **200 Ω** across a d.c. supply of **25 volts** in forward bias. Determine the voltage across the load and the load current. 04

a) Show the symbol of a ZENER diode and sketch the reverse V-I characteristic. Mark the parameters: V_Z, I_{ZK}, $I_{Z\text{-}MAX}$ on the sketch and explain their significance. 08

b) Discuss with circuit diagram and wave forms of input a.c. voltage and load current, the operation of full wave diode rectifier using two diodes. Obtain expressions for d.c. average load current and % load voltage regulation, considering diode to have forward conducting resistance, R_F. 08

c) A ZENER voltage regulator has a Zener of V_Z = **6 volts.** The load resistance across the Zener is **100 Ω**. Calculate the value of resistance in series with d.c. supply of **9 volts** with a current of **30 mA** in the Zener. If the load is disconnected, what is the value of current in Zener? 04

Unit – II

a) Show the symbol for a NPN transistor, mark the base, collector and emitter terminals. Indicate the directions of currents in these terminals. Define **α** and **β** and obtain value of **β** in terms of **α.** Under what bias conditions of BE junction and BC junction will the transistor operate as amplifier? Draw circuit of transistor in common emitter configuration with required d.c. supplies for operation as amplifier. 08

b) Sketch output characteristics of NPN transistor in CE configuration for different base currents. Mark cut off, active and saturation regions and explain. 06

c) A NPN transistor in CE configuration is to have a quiescent operating condition with V_{CE} = **12 volts** and I_C = **10 mA** with collector circuit d.c. supply **(Vcc)** of **24 volts.** Calculate the value of collector resistance, Rc. If **β** of transistor is **100**, what should be value of current into base, I_B? 06

a) Show the circuit of NPN transistor in Common base configuration. Show the direction of currents and polarities of collector and base circuit d.c. supplies. Sketch input and output characteristics for this circuit. Mark and explain different regions of operation. 08

b) Discuss with a sketch of output characteristic for CE configuration, the method of load line analysis to fix a proper quiescent operating point. 06

c) A circuit of NPN transistor in CE configuration with base bias is having a base current, I_B = **100 μA**. The d.c. supply voltage for base and collector circuit is 15 volts. If V_{CE} = **7.5 volts** and transistor **β** is **50**, determine the values of (i) collector current, Ic, (ii) Base resistance, R_B and (iii) collector resistance , Rc . Neglect base – emitter voltage drop. 06

P.T.O.

4. a) With circuit diagram, explain CE configuration of NPN transistor. Sketch input and output characteristics. Mark regions of operation in output characteristics. 8

b) Draw a typical SCR forward output characteristics and indicate the parameters and their ranges. 6

c) Draw a SCR circuit with Mains AC as input voltage, for a 90° phase control and explain its operation. 6

Unit – III

5. a) With a block diagram, explain the operation of series voltage negative feedback amplifier. If gain of amplifier is A_V and feedback factor is β, derive the expression for closed loop gain of the circuit. 8

b) State Brakhausen criterion with necessary diagrams and bring out its significance. 6

c) Calculate the closed loop gain for the negative feedback amplifier when open loop gain A_V = 20000 and feedback factor, β = 0.01. Also calculate the closed loop gain when the open loop gain is changed by ±20 %. 6

6. a) Draw the circuit of a transistor Colpitt's oscillator and explain its operation. Give the equation for frequency of oscillations. 8

b) What is an oscillator? Explain the basic principle of sinusoidal oscillators with the help of block diagram. 6

c) Design a Hartley oscillator. Calculate the values of L_1 and L_2 if the frequency of oscillations is 30 K Hz and C = 0.1 μF and feedback factor, β = 1.

Unit – IV

7. a) Design a scaling adder circuit to give the output $V_0 = -(3V_1+4V_2+5V_3)$. Choose R_f = 100KΩ. 6

b) Define Frequency modulation and explain with necessary waveforms. 6

c) Draw a neat block diagram of CRT and explain the detailed function of each block. 8

8. a) Design non-inverting operational amplifier circuit having R_f=100kΩ, R_1=10kΩ, biased with ±15V_x. Calculate (i) Gain (ii) output voltage when an input of 0.7V is applied. 6

b) Derive the expression for output voltage for opamp differentiator circuit with circuit diagram. 6

c) List the advantages and disadvantages of AM. 8

Unit – V

9. a) Convert (3576)8 to Hexadecimal 4

b) Convert i) $(28)_{10}$ to binary ii) $(11001.1101)_2$ to Decimal. 4

c) Subtract using 2's complement
110010 - 111010 6

d) Realize logic function using basic gates

$$y = \bar{A}\,\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$$

6

10. a) Design Full adder circuit and implement it using two-half Adders 8

b) Draw the symbol, prepare the truth table and design a logic circuit for exclusive - OR gate. 6

c) Realize following function using NAND gate $y = \bar{A}B + A\bar{B}$ 6

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester B.E. (Credit System) Degree Examinations 100 out

November - December 2015

15EC112 – BASIC ELECTRONICS

Time: 3 Hours

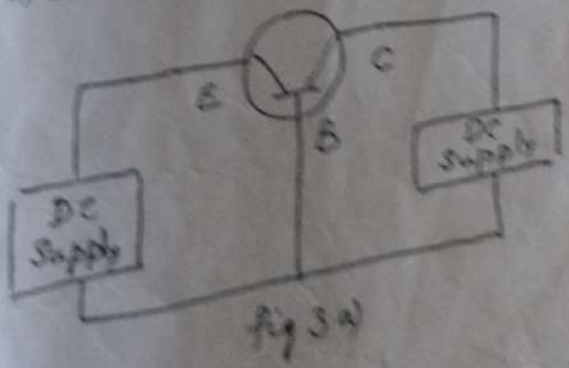
Note: Answer **Five full** questions choosing **One full** question from **each Unit.**

Max. Marks:100

Unit – I

		Marks	BT*
a)	With circuit diagram of diode bridge rectifier with resistive load, explain operation. Sketch waveforms of input voltage and output current. Considering diodes to be ideal, derive expressions for output average D C voltage and output RMS current.	10	L3
b)	Sketch the reverse V - I characteristic of a Zener Diode. Mark important parameters on the same and explain.	6	L2
c)	A Zener of $V_z = 5$ **volts** is used with a D C supply of **10 volts** in a loaded Zener voltage regulator. The resistance in series with the input is **100Ω** and $I_{z\,min} = 10$ **mA.** Calculate minimum value of load resistance.	4	L4
a)	Sketch forward and reverse V-I characteristics of silicon diode. Mark cut in voltage, dynamic resistance and reverse breakover voltage. Explain their significance.	6	L2
b)	Explain the purpose of a D C load line in analysis of diode circuit operating in forward bias from a D C supply with a series resistance. Write the equations for drawing the load line and explain.	8	L4
c)	A germanium diode having a dynamic resistance, $r_d = 5\ \Omega$ is connected in series with a load resistance, $R_L = 100\ \Omega$ across a D C supply of **10 volts.** Determine the value of current in the load resistance.	4	L5

Unit – II

a)	In a typical NPN-BJT Common Base two Power supply Circuit, biased in active region, indicate i) their polarity ii) direction of currents.  Fig 3 a)	8	L2
b)	Calculate I_C and I_E for a transistor that has $\alpha_{dc} = 0.98$ and $I_B = 100\ \mu A$. Also determine the value of β_{dc} for the transistor.	6	L3
c)	Discuss the affect of emitter resistor in transistor bias circuits and transistor DC load line calculations.	6	L4

P.T.O.