SN – 284

I Semester B.Sc. Examination, Nov./Dec. 2014
(Semester Scheme) (NS) (2011-12 and Onwards)
ELECTRONICS – I
Basic Electronics

Time : 3 Hours Max. Marks : 70

Instructions : *Answer **any five** questions from Part – **A**, **four** questions from Part – **B** and **five** sub-questions from Part – **C**.*

PART – A

Answer **any five** questions : **(5×8=40)**

1. a) What are active and passive components ? Give one example for each.
   b) Derive an expression for the Decay of charge in a series RC circuit excited by a D.C. source. Define 'Time constant' of this circuit. **(3+5)**

2. a) For a sinusoidal signal, define the terms 'Time period', 'Peak to peak value' and 'average value'.
   b) With the help of circuit diagrams, explain the steps to Nortonise a resistive network. **(3+5)**

3. a) With a diagrammatic representation explain the formation of depletion layer in a PN junction.
   b) Explain the mechanisms of Zener and Avalanche Breakdowns in a PN junction. **(4+4)**

4. a) Draw the circuit of a full wave rectifier with centre tapped transformer. Explain its working. Sketch the input and the output waveforms.
   b) What are Clipping and Clamping circuits ? Draw the circuit of a positive Clipper. **(5+3)**

5. a) With a relevant diagram, explain the working of an NPN transistor.
   b) Define the terms 'α' and 'β' for a transistor. Arrive at the expression for α in terms β. **(4+4)**

6. a) Draw the output characteristics of a transistor in C.E. mode and explain its different regions.
   b) Define the hybrid parameters for a transistor in C.E. mode. **(4+4)**

P.T.O.

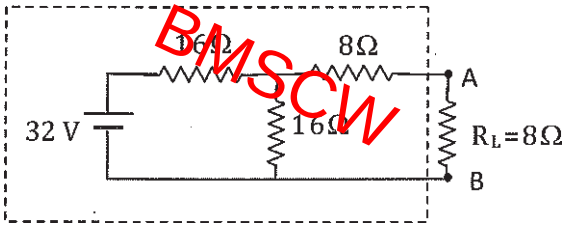
7. a) Draw the circuit of a CE amplifier and explain its working. Draw its frequency response curve.
   b) Name any two applications of a CC amplifier. **(6+2)**

8. a) Explain with example, method to convert a decimal number into its Hexadecimal Equivalent.
   b) Write the Excess 3 and Gray code equivalents for all the decimal digits. **(3+5)**

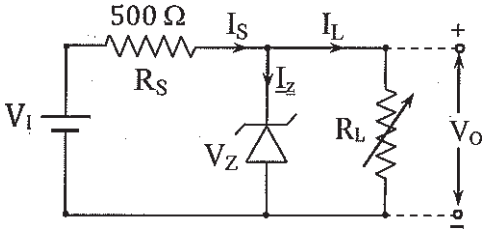
PART – B

Answer **any four** questions : **(4×5=20)**

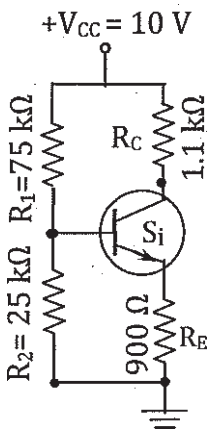
9. Draw the Thevenin's equivalent circuit for the dotted portion of the network shown and find the current through load resistor R_L.



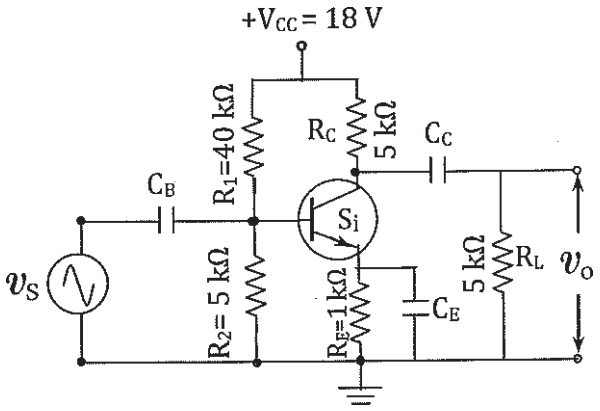
10. Calculate $R_{L(min)}$ and $R_{L(max)}$ in the circuit shown for getting regulated output voltage. Given : V_z = 5V, V_I = 30 V and $I_{Z(max)}$ = 30 mA.



11. Draw the D.C. load line and mark the operating point for the biasing circuit shown. Given : β = 100.



12. For the given Transistor amplifier circuit, calculate the voltage gain using r_E model. Consider the thermal potential at E-B junction as 26 mV.



13. a) Perform the subtraction of the following binary numbers using 2's complement method.

i) $11111_{(2)} - 1110_{(2)}$ ii) $101_{(2)} - 1001_{(2)}$.

b) Add $D3_{(16)}$ with $44_{(16)}$. **(2+2+1)**

14. a) Convert the following binary numbers into Hexadecimal

i) $111101101_{(2)}$ ii) $1110111_{(2)}$

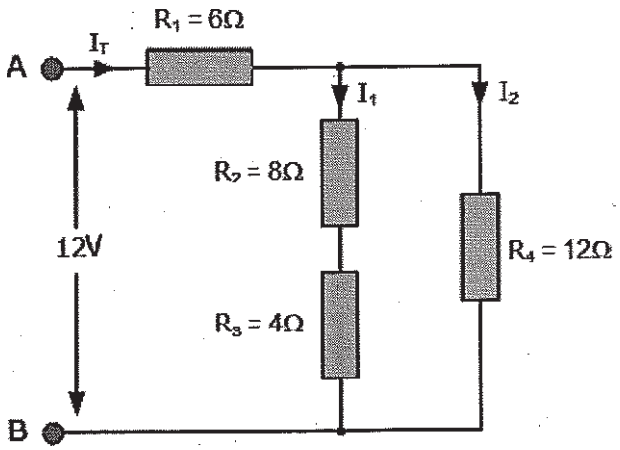
b) Convert the following decimal numbers into binary

i) $22.3_{(10)}$ ii) $34.60_{(10)}$ **(2+3)**

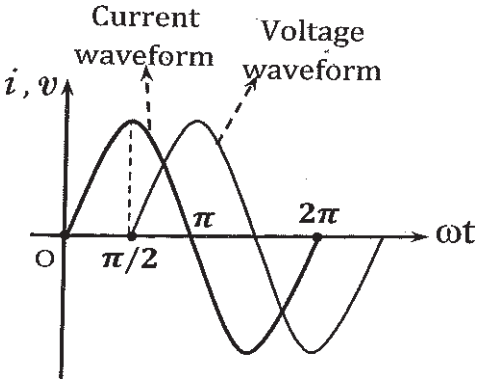
PART – C

Answer **any five** sub-divisions : **(5×2=10)**

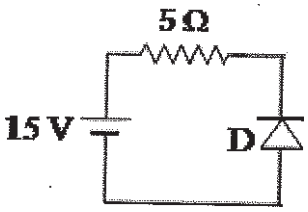
15. a) Calculate the current I_T in the circuit shown.



b) Identify the circuit for which the voltage and the current waveforms are shown in the figure. Write the expression for phase angle.

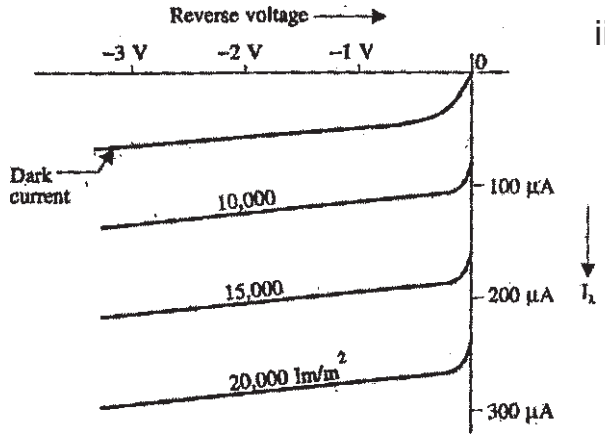


c) Find the value of current through 5Ω resistor in the circuit shown.

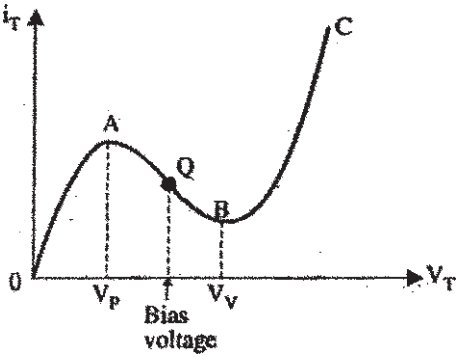


d) Identify the devices for which the characteristics are shown below :

i)



ii)



e) Emitter and collector leads in a transistor circuit can not be interchanged though the regions are made of same type of extrinsic semiconductors. Justify.

f) In a CE amplifier, why the voltage gain decreases in high frequency region ?

g) If A_1, A_2 and A_3 are the voltage gains of individual stages in a three stage amplifier, write the expression for overall gain.

h) Write the next consecutive numbers in the following array of BCD numbers.
0111, 1000, 1001, _____, _____.

_____

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I Semester B.Sc. Examination, Nov./Dec. 2014
(Semester Scheme) (NS) (2009-10 and Onwards)
ELECTRONICS – I
Basic Electronics

Time : 3 Hours | Max. Marks : 60

Instructions : *Answer **any five** questions from Part – **A**, **four** questions from Part – **B** and **five** sub-divisions from Part – **C**.*

PART – A

Answer **any five** questions : **(5×6=30)**

1. a) Define the terms :
   i) time period and
   ii) peak value for an ac signal
   b) Derive an expression for the impedance of a series RL circuit connected to an ac source. **(2+4)**

2. a) State maximum power transfer theorem.
   b) State and explain how to apply superposition theorem to a resistive network. **(2+4)**

3. a) Explain the working of a zener diode as line regulator.
   b) What is a clipping circuit ? Draw the circuit of a positive clipper. **(3+3)**

4. a) Explain the mechanism of avalanche breakdown.
   b) Draw the circuit symbol and characteristics of a varactor diode. Mention its applications. **(3+3)**

5. Explain the procedure to draw the input and output characteristic curves for a transistor in CE mode and determine the value of output resistance and current gain from the output characteristic curve. **6**

6. a) Explain the operation of transistor as a switch.
   b) What is meant by transistor biasing ? Mention the different types of biasing circuits ? **(4+2)**

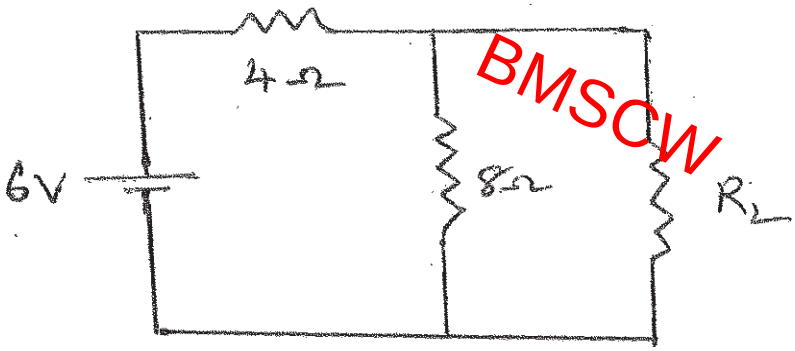
7. a) Draw and explain the frequency response curve of a CE amplifier.
   b) Mention the applications of CC amplifier. **(4+2)**

8. a) Explain the steps involved in the subtraction of two hex numbers by the 2's complement method.
   b) What is an Excess-3 code ? Explain with example. **(4+2)**

PART – B

Answer **any four** questions : **(4×5=20)**

9. Find the Thevenin equivalent circuit for the given network. Then find the current through R_L for values 10Ω, 5Ω and 25Ω.



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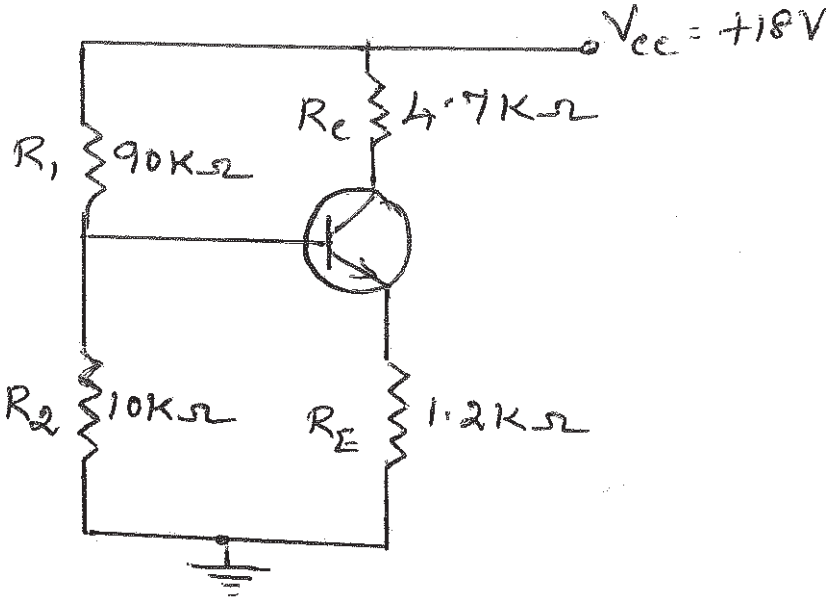
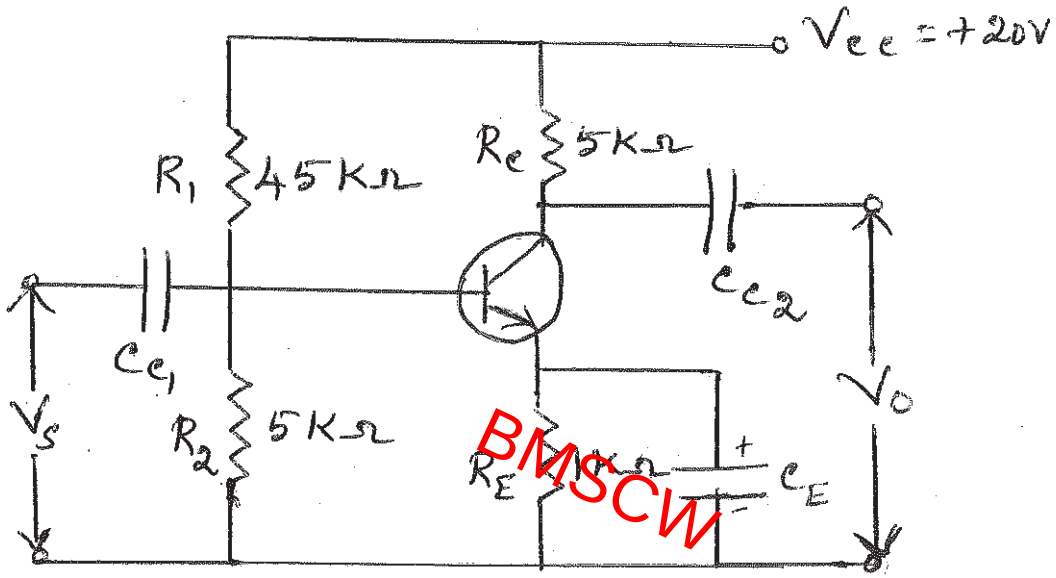
10. In a centre-tap full wave rectifier, the load resistance is $2K\Omega$. Each diode has a forward dynamic resistance r_d of 10Ω. The peak value of voltage across the secondary winding is 210 V. Find the ripple factor and efficiency of rectification. **5**

11. Determine the operating point for the given circuit. Given $V_{BE} = 0.7$ V and $\beta = 120$.



5

12. For the circuit shown, calculate the values of A_V and r_{out}. Given $V_{BE} = 0.7$ V and $\beta = 100$.



5

13. a) Convert the following :

i) $(45.39)_{10} = (\quad)_2$

ii) $(10110.101)_2 = (\quad)_{16}$

b) i) $(69)_{10} = (\quad)_{BCD}$

ii) $(36)_{10} = (\quad)_{Excess\text{-}3\ code}$ **(3+2)**

14. Subtract $(76)_{10}$ from $(76)_{16}$ using 2's complement method and express the result in decimal. **5**

PART – C

Answer **any five** subdivisions : **(5×2=10)**

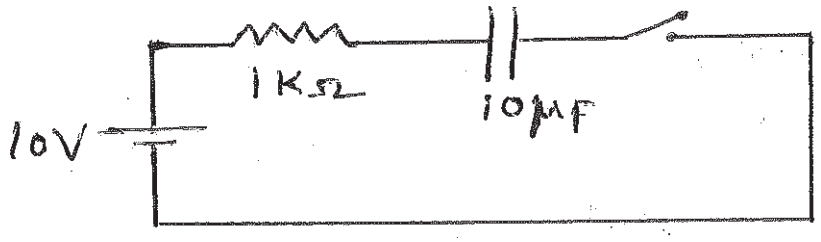
15. a) The instantaneous voltage and current through a component is given by

$V = 500 \sin(157t + 40°)$

$i = 2 \sin(157t + 130°)$

Identify the component. **2**

b) As soon as the switch is closed in the circuit shown below, current rises to 10 mA. Why ?



2

c) Name any two devices that can be used as voltage regulators. **2**

d) Draw the output waves of a full wave rectifier **2**

a) Without a shunt capacitor filter

b) With a shunt capacitor filter.

e) What is meant by dark current in a photo diode and mention one application of photo diode ? **2**

f) What is an emitter follower. Why it is called so ? **2**

g) Mention the invalid BCD codes. **2**

SN – 284

I Semester B.Sc. Examination, Nov./Dec. 2014
(Semester Scheme) (OS) (Prior to 2009-10)
ELECTRONICS – I
Electronics Fundamentals – I

Time : 3 Hours | Max. Marks : 60

Instructions : *Answer* ***any five*** *questions from Part –* ***A****,* ***four*** *questions from Part –* ***B*** *and any* ***five*** *sub-questions from Part –* ***C****.*

PART – A

Answer **any five** questions : **(5×6=30)**

1. a) Define the terms :
   i) Voltage rating
   ii) Leakage current with respect to capacitors.
   b) Explain the construction of carbon film potentiometer. **(3+3)**

2. a) Define an Ideal current source. When does the practical current source behaves like stiff current source.
   b) Mention the steps involved to calculate branch currents using Branch current method. **(2+4)**

3. Derive an expression for the growth of current through an Inductor at any instant of time in a series RL circuit excited by a dc source.

4. a) Define the terms :
   i) Time period
   ii) Frequency of an ac signal.
   b) Derive an expression for impedance and current in the circuit having a Inductor L and resistor R in series is applied with ac source. **(2+4)**

5. a) Define the terms :
   i) average value
   ii) phase of an ac signal.
   b) Distinguish between series resonance circuit with parallel resonance circuit. **(2+4)**

6. State and prove maximum power transfer theorem for dc circuit.

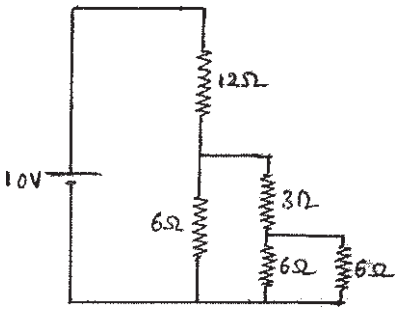
7. a) Explain the formation of depletion layer in pn junction diode.
   b) What is Zener break down ? **(4+2)**

8. Explain VI characteristics of a semiconductor diode under forward bias and reverse bias.

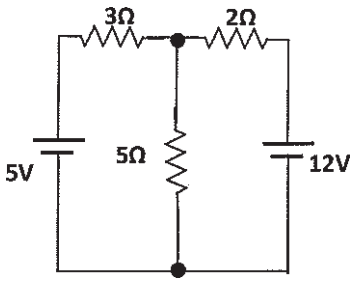
PART – B

Answer **any four** questions : **(5×4=20)**

9. Calculate the effective resistance in the combination of resistors and determine the voltage drop across all the resistors.



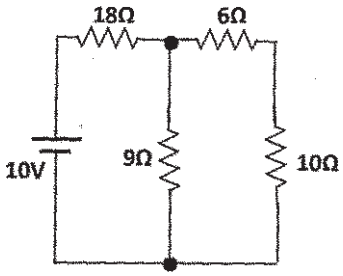
10. Using mesh current method, find the branch currents for the following circuit.



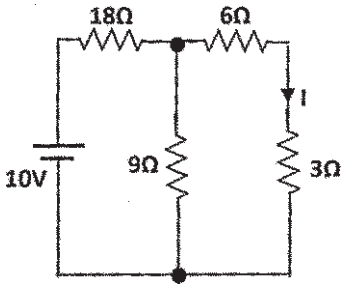
11. A dc source of 200 V, resistor of 100 kΩ and capacitance of 5 μF are connected in series. Calculate
    i) time required for the voltage to reach 1/3rd of steady state voltage.
    ii) time constant of RC circuit.

12. A series resonance circuit consists of R = 50Ω, L = 50 mH and C = 2 nF, calculate the
    a) Resonant frequency
    b) Impedance
    c) Band width.

13. Using thevenin's theorem, calculate the current through the 10 Ω resistor.



14. For the following circuit, verify the reciprocity theorem.



PART – C

15. Answer **any five** questions : **(2×5=10)**

a) What is the effective voltage of two cells each of 1.5 V connected in series ?

b) What happens to voltage across and current through the open circuited resistor ?

c) Why parallel resonance circuit is called rejector circuit ?

d) What is power factor of pure resistor ?

e) Is diode a bilateral device ? Justify.

f) When does intrinsic semiconductor behave as insulator ? Justify

g) Mention the application of Zener diode.