Code No: 131AK

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, May - 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to EEE, ECE, CSE, EIE, IT, ETM)

Time: 3 hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Define dependent sources. [2]
 b) The essential component of a toaster is an electrical element (a resistor) that converts
   electrical energy to heat energy. How much current is drawn by a toaster with resistance
   15Ω at 110 V? [3]
 c) What is the condition for maximum power transfer in ac circuits? [2]
 d) Derive the expression for resonant frequency. [3]
 e) Define reverse break down voltage of a diode. [2]
 f) Derive an expression for the average output voltage of a full wave rectifier. [3]
 g) Draw the high frequency model of a transistor. [2]
 h) In a BJT, the emitter current is 12 mA and the emitter current is 1.02 times the collector
   current. Find the base current. [3]
 i) Why FET is called unipolar device? [2]
 j) What are the special features of FET? [3]

PART-B

(50 Marks)

2.a) Differentiate between active and passive elements.
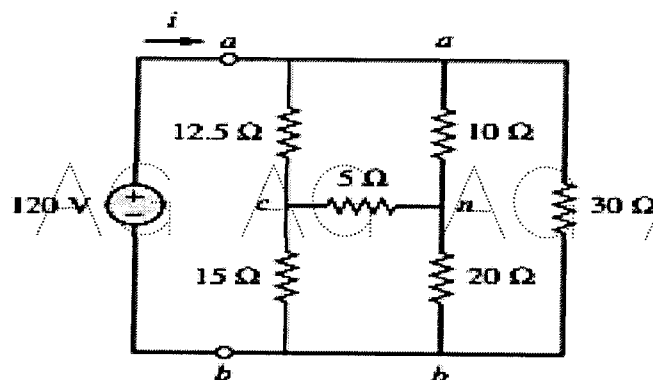 b) Obtain the equivalent resistance for the circuit in figure 1 and use it to find current *i*.
 [4+6]

Figure: 1
OR

3.a)   Define impedance, susceptance and admittance with examples.
 b)   Using mesh analysis, find I_o in the circuit shown in figure 2.   [4+6]
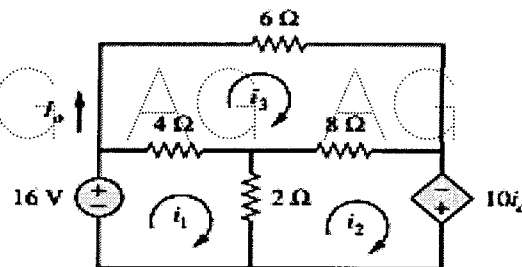

Figure: 2

4.a)   The Q factor of a RLC series circuit is 5 at a resonance frequency of 1 KHz. Assuming the power dissipation of 250W, when the current drawn is 1A, find the circuit parameters.
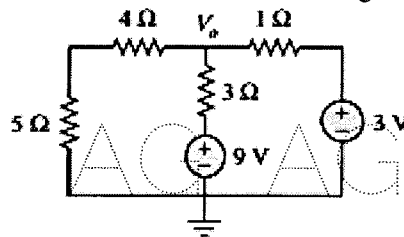 b)   Using superposition, find V_o in the circuit shown in figure 3.   [5+5]

Figure: 3

OR

5.a)   A 5 μF condenser is connected in series with a coil having inductance of 50mH. Determine the frequency of resonance, the resistance of the coil if a 50V source causing a current of 10mA is connected. What is the Q factor of the coil?
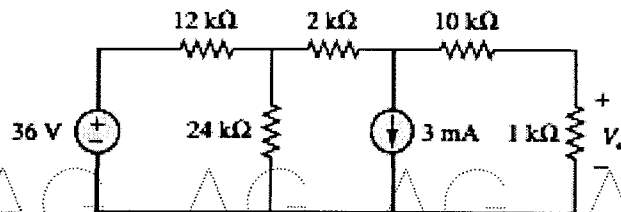 b)   Use Norton's theorem to find V_o in the circuit shown in figure 4.   [4+6]

Figure: 4

6.a)   Draw the V − I characteristics of a silicon diode, write an expression for diode current and discuss how cut in voltage changes with temperature.
 b)   Draw the circuits of a full wave rectifier using 2-diodes and 4-diodes. Discuss the relative merits and demerits.   [5+5]

OR

7.a)   Define diffusion capacitance in a P-N junction diode and discuss its dependence on diode biasing.
 b)   Derive expressions for ripple factor and efficiency of rectification for a full wave rectifier.   [5+5]

8.a) Derive expressions for voltage gain, input-resistance and current gain for an emitter follower.

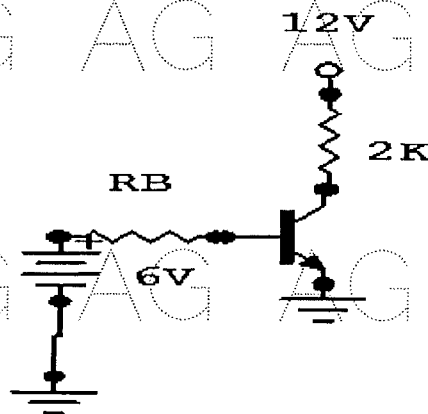   b) In the Silicon Transistor circuit shown in figure 5, find the maximum base resistance R_B to drive the Transistor into saturation.   [5+5]

Figure: 5

OR

9.a) Discuss the need for biasing a transistor. Briefly explain about self biasing.

   b) Explain how h-parameters can be determined from the static input and output characteristics.   [5+5]

10.a) Discuss the characteristic differences between a BJT and a FET. Draw a diagram depicting the structure of a N-channel FET and identify the various terminals and the biasing voltages.

   b) Explain how the pinch off voltage can be modified without changing the physical structure of a JFET.   [5+5]

OR

11.a) Explain the operation of a FET with a neat diagram and V-I characteristics.

   b) An N-channel JFET has a pinch voltage of -4.5V and I_{DSS} = 9mA at what value of V_{GS} will I_{DS} equal to 3mA? What is its g_m at this I_{DS}.   [5+5]

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