

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  $15\Omega$  at  $110\text{ V}$ ? [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  $12\text{ mA}$  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]

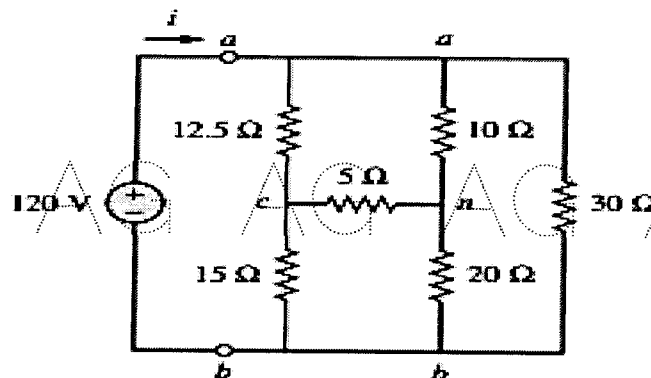


Figure: 1  
OR

- 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]

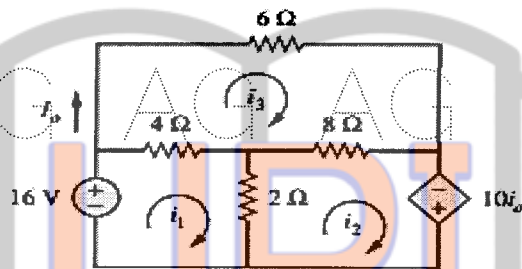


Figure: 2

- 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]

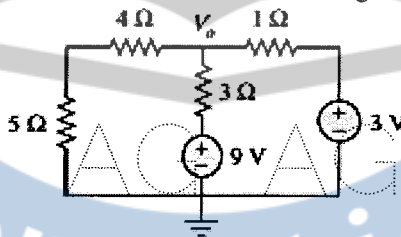


Figure: 3

OR

- 5.a) A 5  $\mu$ F 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]

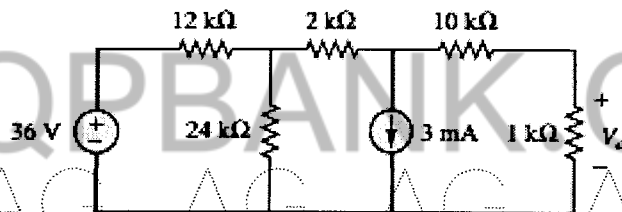


Figure: 4

- 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]

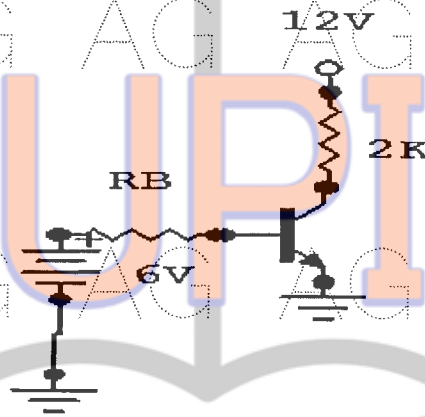


Figure: 5

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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