Code No: 131AK

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, December - 2016
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to EEE, ECE, CSE, EIE, IT)

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) What is the significance of j- notation in analysis of A.C circuits? [2]
b) Obtain the V-I relationship for passive elements. [3]
c) What is the relation between bandwidth and quality factor in RLC series resonant circuit? [2]
d) State Tellegen's theorem. [3]
e) What is a bleeder resistance? Why it is used in L-C filter? [2]
f) Determine AC resistance for a semiconductor diode with a forward bias of 0.25V. Reverse saturation current at room temperature is of 1.2μA. [3]
g) What is thermal runaway in transistor amplifier circuit? [2]
h) In a transistor determine base current if emitter current is 1.00 mA and collector current is 0.92 mA. [3]
i) Define pinch-off voltage of a JFET. [2]
j) What are the relative merits and demerits of a FET amplifier over a transistor amplifier? [3]

PART-B **(50 Marks)**

2.a) Find equivalent resistance R_{ab} in figure 1. Resistor values are in ohms.

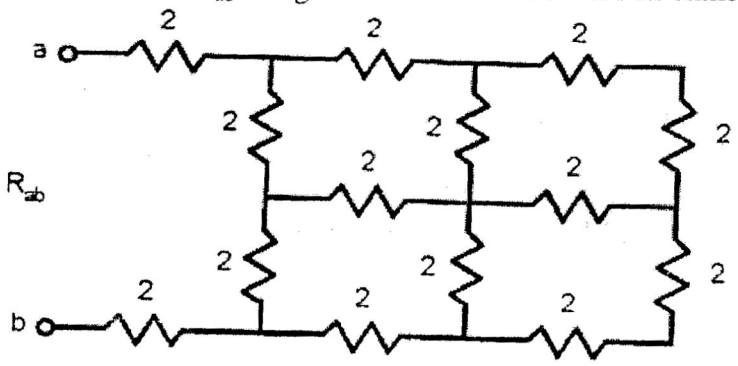

Figure: 1

b) Find the voltage across terminals 'a' and 'b' of the circuit as shown in figure 2 using source transformation. [6+4]

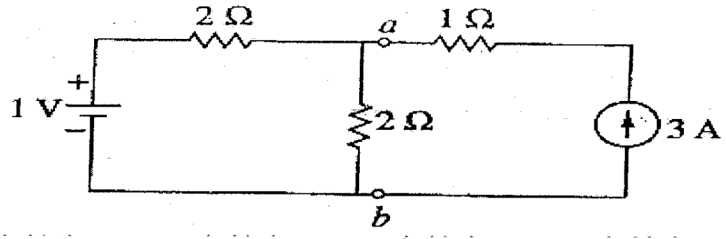

Figure: 2

OR

3.a) Derive an expression for power in a single phase circuit contains R, L elements in series across sinusoidal voltage.

b) A coil takes a current of 2.5 A at 0.8 lagging power factor from a 220 volt 60Hz single phase source. If the coil is modeled by a series RL circuit, find i) the complex power in the coil and ii) the values of R and L. [5+5]

4.a) An inductance of 0.5 H, a resistance of 5 ohm and a capacitance of 8 μF are in series across a 220 V a.c supply. Calculate the frequency at which the circuit resonates. Find the current at resonance, bandwidth, half power frequencies and the voltage across capacitance at resonance.

b) In the network shown in figure 3, the load consists of fixed capacitive reactance of 15Ω and a variable resistance R_1. Determine i) the value of R_1 for which the power transferred is a maximum and ii) The value of maximum power. [5+5]

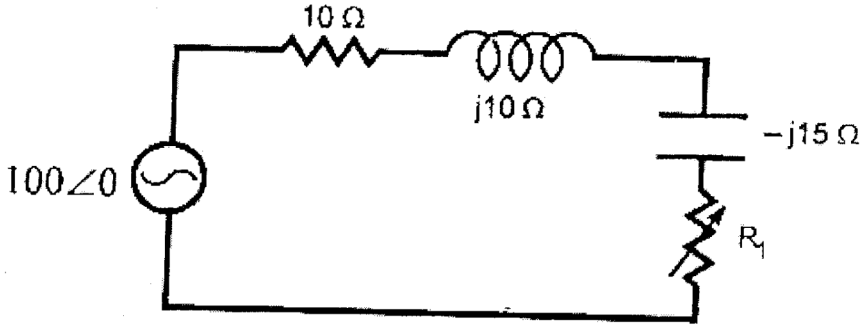

Figure: 3

OR

5.a) State and explain compensation theorem.

b) In the given figure 4, find the current flowing through R_1 using Thevenin's theorem. [4+6]

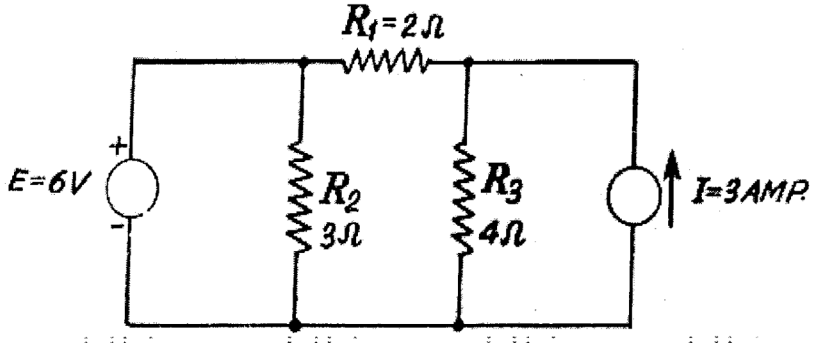

Figure: 4

6.a) Define diffusion capacitance of a P-N junction diode. Obtain an expression for the same. Why is the diffusion capacitance negligible for a reverse-biased diode?

b) A full-wave rectifier uses a double diode with each element having a constant forward resistance of 600Ω. The transformer r.m.s secondary voltage from the centre tap to each side is 280V and the load has a resistance of 3KΩ. Determine i) dc output power ii) ac input power iii) the rectification efficiency and iv) voltage regulation from no load to full-load. [5+5]

OR

7.a) Draw the circuit diagram of a full-wave bridge rectifier circuit and calculate i) I_{dc} ii) I_{rms} iii) ripple factor iv) efficiency of rectification and v) PIV rating of diode.

b) A half-wave rectifier has a load resistance of 4KΩ. If the diode and secondary of the transformer have a total resistance of 800Ω and the input voltage has an ac signal of 220V (peak value), determine i) peak, average and r.m.s values of current flowing ii) dc power output iii) ac power input iv) rectification efficiency and v) ripple factor. [5+5]

8.a) Sketch typical CB input characteristic curves for an NPN transistor. Label all variables. How would you calculate the input dynamic resistance of the transistor?

b) What is early effect? Explain how it affects the BJT characteristics in CB configuration. [6+4]

OR

9.a) Draw the biasing circuits in cases of i) fixed bias ii) fixed bias with resistor R_E in series with emitter and reference ground iii) potential divider bias.

b) A common emitter transistor amplifier circuit has the following characteristics: h_{ie} =1000Ω, h_{fe}=50, $h_{re}=2.5\times10^{-4}$, $h_{oe}=25\times10^{-6}$A/V. If the load resistance R_L=10KΩ and source resistance is 100Ω. Find the input resistance, output resistance and the voltage, current and power gains. [5+5]

10.a) What is meant by depletion region in JFET? Explain with suitable diagrams what are the basic differences between BJT and JFET?

b) When gate-source voltage is -12V and gate current is 1×10^{-6}mA, determine the resistance between the gate and source of a given JFET. [6+4]

OR

11.a) Explain how can a Zener diode be used as voltage regulator.

b) State and explain different applications of SCR and Tunnel diode. [5+5]

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