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UNIVERSITY REGULAR EXAMINATIONS

2013 /2014 ACADEMIC YEAR

2ND YEAR 2ND SEMESTER EXAMINATIONS

(MAIN EXAMINATION)

FOR THE DEGREE OF BACHELOR

OF SCIENCE IN PHYSICS

COURSE CODE: SPH 216

COURSE TITLE: ELECTRONICS I

DATE: 15TH APRIL 2014 **TIME: 2:00P.M. – 5:00P.M.**

INSTRUCTIONS

- *Attempt Question ONE and any THREE of the remaining*
- *Question ONE carries 28 marks and all the remaining 14 marks each.*
- *Symbols used herein bear **usual meaning.***

INSTRUCTIONS TO CANDIDATES

QUESTION ONE

a) Define the following terms; (i) Emitter (ii) Branch (iii) Biasing (iv) Passive element.[4 mks]

b) Explain why the *quiescent point* of a transistor is generally preferred in the middle of the active region of output characteristics. [2 mks]

c) Distinguish between a *Zener* diode and a *Photodiode.* [2 mks]

d) Apply appropriate circuit laws to the network of Figure 1 below and obtain the current through R_1. [4 mks]

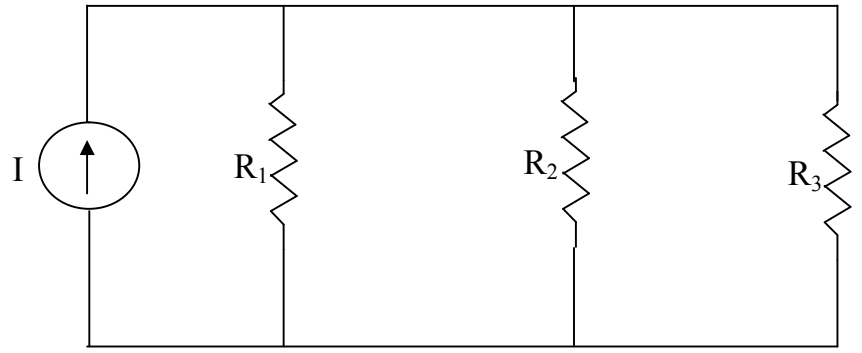

Fig. 1

e) State the *Superposition theorem,* hence outline the procedure of calculating the output voltage/current using this theorem, [3 mks]

f) Use Nodal analysis to solve the circuit of figure 2; [4 mks]

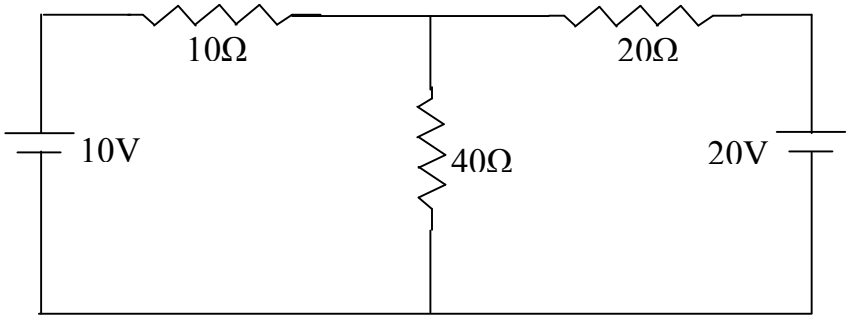

Fig. 2

g) Calculate the amplification factors and output current of a pnp transistor connected in CB mode. {Use: $I_E = 2mA$, $I_B = 20\mu A$} [3 mks]

h) Give the fundamental differences between the following terms; (i) Potential difference and Electromotive force (ii) Junction and Node (iii) Mesh and Loop [6 mks]

QUESTION TWO

a) Define and state the significance of; (i) Load line (ii) Q-point [6 mks]

b) Using the CB configuration of an npn transistor shown in figure 3 below, compute the (i) dc load line (ii) dc operating point (iii) peak-to-peak unclipped signal. [8 mks]

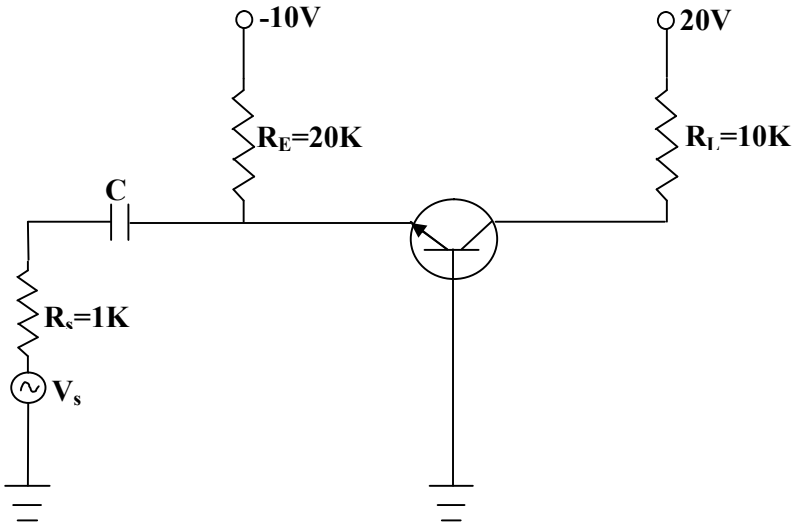

Fig. 3

QUESTION THREE

a) Explain the phenomenon of the formation of the depletion layer; hence give reasons why charge flows in only one direction across a p-n junction. [6 mks]

b) With aid of diagrams, discuss the forward and reverse bias of a p-n junction and the respective characteristics. [8 mks]

QUESTION FOUR

a) State (i) Norton's theorem (ii) Thevenin's theorem [4 mks]

b) (i) What is the significance of Thevenin's theorem? [2 mks]

(ii) Using Thevenin's theorem, calculate the current flowing through the 12Ω resistor in [6 mks]

figure 4

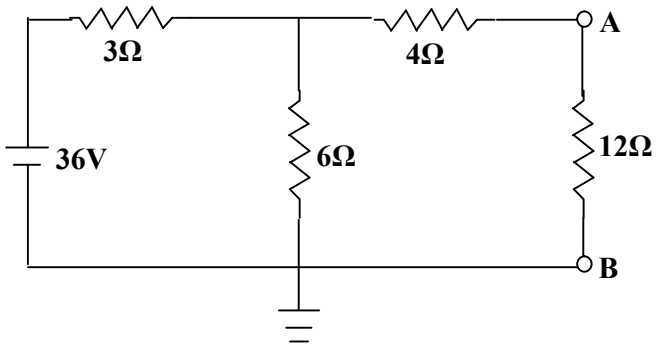

Fig. 4

(iii) Draw the equivalent circuit of (b), (ii) above. [2 mks]

QUESTION FIVE

a) Outline the procedure used in Mesh analysis. [3 mks]

b) Use Mesh analysis to solve the network of figure 5 below and obtain the currents flowing through the 3Ω and 2Ω resistors. [8 mks]

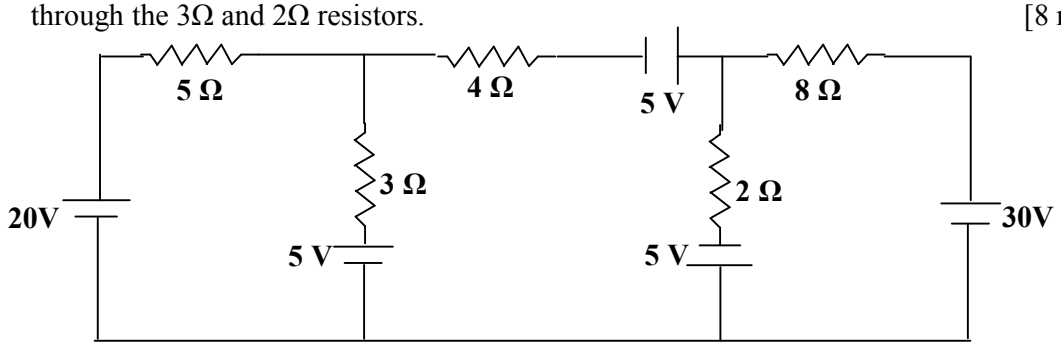

Fig. 5

c) State the main differences between Mesh analysis and Nodal analysis [3 mks]

QUESTION SIX

a) Why is a Wheatstone circuit called a bridge? [1 mks]

b) Explain the following circuit phenomena; (i) A wire carrying a current is not charged (ii) The formular V = IR does not absolutely obey Ohm's law. [4 mks]

c) State (i) Kirchhoff's Current law and (ii) Kirchhoff's Voltage law completely. [4 mks]

d) Calculate the values of the new currents in the circuit figure 6 when the value of R_3 is increased by 30% [5 mks]

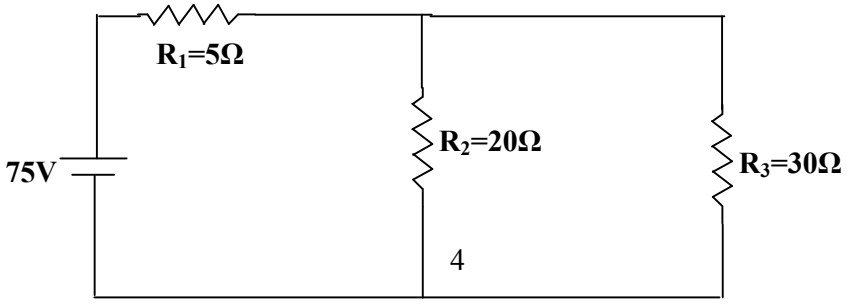

Fig. 6