FE215

Total No. of Printed Pages: 4

F. E. (Semester-II) (Revised Course 2007-08)
EXAMINATION SEPTEMBER 2020
Basic Electronic Engineering

[Duration : Two Hours] **[Total Marks : 60]**

Instructions:
1) Answer THREE FULL QUESTIONS with ONE QUESTION from ANY THREE MODULES.
2) Draw neat, labeled diagram wherever necessary.
3) All symbols and abbreviations carry their usual meaning.
4) Make suitable assumptions when necessary.

MODULE- I

Q1. a) What is meant by dynamic resistance of a semiconductor diode? Explain how it is determined graphically. (6 marks)

b) Explain the piecewise-linear equivalent circuit for a silicon diode using relevant diagrams. (4 marks)

c) Differentiate between transition and diffusion capacitance in a p-n junction diode. (4 marks)

d) i) Determine the current I for the network of fig 1 (6 marks)

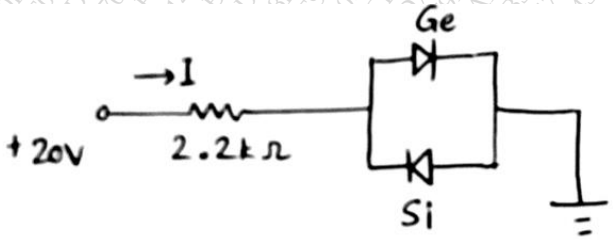

Fig 1

ii) Determine V_O and I_D for the following network (Fig 2)

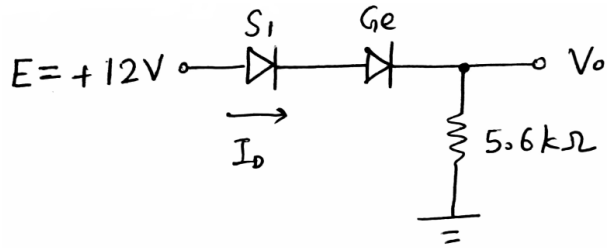

Fig 2

What is the minimum value of E required in the above circuit for current to flow in the circuit?

Q2. a) For the Zener diode voltage-regulator circuit in Fig 3, determine V_L, V_R, Iz and Pz. (5 marks)
Comment on the safety of operation of the Zener diode.

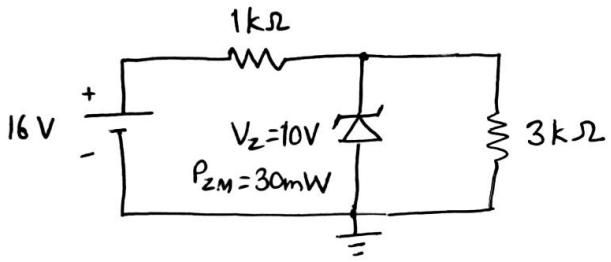

Fig 3

b) What are diode clamping networks? For the following network. Determine the output waveform. (5 marks)

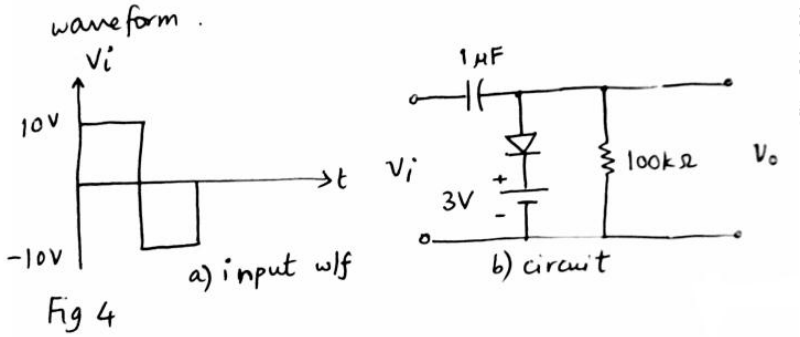

Fig 4

c) With a neat circuit diagram and waveforms, explain the working of a half-wave rectifier, and derive the expression for V_{rms} and V_{dc} (8 marks)

d) Explain Peak Inverse Voltage (PIV) for a rectifier circuit. (2 marks)

MODULE -II

Q3. a) Explain the amplifying action of a bipolar junction transistor with a neat diagram. (5 marks)

b) Explain the cut-off region for a common-emitter BJT transistor configuration. Obtain the relationship between I_{CEO} and I_{CBO} (5 marks)

c) For the following network of Fig 5, determine (6 marks)
i) I_B, ii) I_C, iii) V_{CE} iv) V_C v) V_E vi) V_B

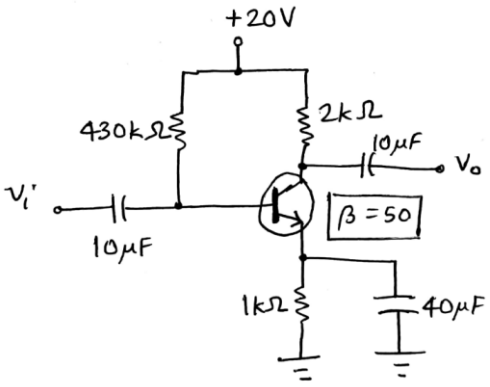

Fig 5: Emitter bias network

d) Explain the working of a BJT as a switch. (4 marks)

Q4. a) With neat diagrams explain the input and output characteristics of a BJT in the common-base configuration. Highlight the three basic regions of interest. (7 marks)

b) Obtain the relationship between α and β for a BJT. (3 marks)

c) Explain the limits of operation for a BJT and define the linear region of operation on the output characteristics. (7 marks)

d) Define a.c. current gain for a BJT. Calculate the same, if a change in I_B from 100μA to 150μA causes a change in I_C from 5mA to 7.5mA. (3 marks)

MODULE- III

Q5. a) Explain in detail the construction and operation of an n-channel JFET. Explain what you mean by pinch-off. (8 marks)

b) Using the shorthand method, obtain the transfer curve for a JFET and a sketch the transfer curve for a p-channel JFET with I_{DSS} = 4mA and V_P = 3V. (6 marks)

c) Explain the construction and basic operation of a n-channel depletion type MOSFET. (6 marks)

Q6. a) With neat circuit diagrams explain the analysis of a FET fixed-bias circuit and obtain expressions for various voltages. (6 marks)

b) With a neat diagram explain the construction and working of CMOS. What are the advantages of CMOS? (6 marks)

c) For the n-channel depletion-type MOSFET of Fig 6, determine: (8 marks)
i) I_{DQ} and V_{GSQ} ii) V_{DS}

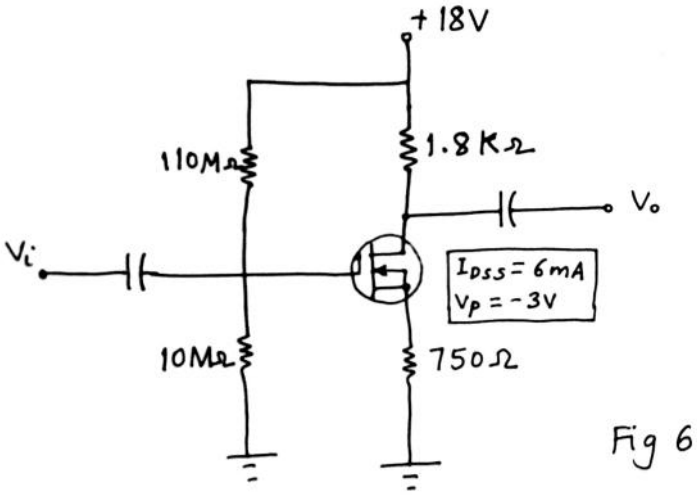

Fig 6

MODULE- IV

Q7. a) Explain the grown-junction and diffusion methods to manufacture discrete transistors with neat diagrams. (6 marks)

b) What is meant by the term monolithic integrated circuit (IC). List the steps in the fabrication of a monolithic IC wafer. (6 marks)

c) Explain the op-amp operation in brief, with single-ended input. (4 marks)

d) Explain the concept of "feedback" and draw the block diagram of a basic feedback amplifier. (4 marks)

Q8. a) Explain the working of a transmissive type field –effect LCD with a diagram. (6 marks)

b) Draw the general block diagram of a cathode-ray oscilloscope (CRO) and explain the operation. (6 marks)

c) Write short notes on (any two): (8 marks)
i) Photo-conductive cells
ii) IR emitters and applications
iii) Silicon controlled rectifier (SCR)