Total No. of printed pages = 4

19/3rd Sem/DECE302

2021

ELECTRONIC DEVICES AND CIRCUITS

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Question No. 1 is compulsory and answer any *four* questions from the rest.

1. (a) Write a short note on n-type semiconductor. 5

   (b) Why semiconductors are popular choice for making electronic components ? 2

   (c) What do you mean by doping in semiconductors ? Mention the different types of doping materials. 1+2=3

   (d) Name the part number of a general purpose pn-diode; mention few applications of diodes. 1+2=3

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(e) Mention the various operation modes of BJT. Which mode is suitable for signal amplification purpose ? 1+1=2

(f) What do you mean by Pinch-off voltage and write the expression for MOSFETs. 1+1=2

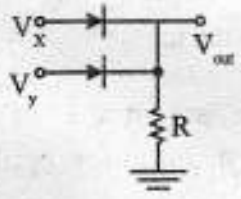
(g) How depletion layer is formed in pn-junctions ? explain in brief. 3

2. (a) Write a comparison between the Zener Breakdown and Avalanche Breakdown. 6

(b) Draw the input and output characteristics of NPN transistor in Common Emitter Configuration. 2+2=4

(c) Derive the expression for I_{CBO} in relation to I_{CEO}. Hence find the relation between α and β. 4+6=10

3. (a) Describe the operation of the circuit if Vx and Vy can be 0V/5V and find the output voltage for different condition of input voltages. Assume ideal diodes. 10



(b) The current gain of a transistor in CE mode is 49. Calculate its CB current gain. Also find the collector current when the emitter current is 3mA. 5

(c) For a certain transistor, base current is 20 μA; Collector current is 2mA and $\beta = 80$. Calculate value of I_{CBO}. 5

4. (a) Describe the operation of n-Channel MOSFET (Enhancement) and draw the I_{DS}~V_{DS} characteristics. 10

(b) (i) Draw the model of NPN transistor in active mode. 4

(ii) Explain the operation of RC filter with proper circuit diagram. 6

5. (a) Describe the construction and working principle of JFET and write the expression for Ids. 6

(b) Compare the Depletion and Enhancement mode of MOSFET. 4

(c) Draw the circuit diagram of Center-tapped transformer based full wave rectifier and derive the expression for average value of output voltage and ripple factor. 10

6. (a) Describe the operation of NPN transistor in Common-Base Configuration, draw the input and output characteristics. 6+4=10

(b) Describe the operation of p-channel MOSFET (Enhancement) and draw the I_{DS}~V_{DS} characteristics. 10