BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – Dip.RA-2022/Dip.RA-2023
Course Name – Electronic Devices and Circuits
Course Code - ECPC302
(Semester III)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) For enhancement mode n-MOSFET, select the appropriate answer for the threshold voltage.

a) Equal to 0 b) Greater than zero or Positive quantity
c) Negative voltage or lesser than zero d) All of the mentioned

(ii) In MOSFET, select when the channel pinches off.

a) $V_{gs}>V_{ds}$ b) $V_{ds}>V_{gs}$
c) $V_{ds}>(V_{gs}-V_{th})$ d) $V_{gs}>(V_{ds}-V_{th})$

(iii) Select for which depletion mode MOSFETs are more commonly used.

a) switches b) resistors
c) buffers d) capacitors

(iv) Identify the primary function of the gate in a JFET.

a) To amplify the input signal b) To control the flow of current between the source and drain
c) To provide mechanical support to the device d) To dissipate heat

(v) In a JFET, define which terminal is used for the biasing voltage.

a) Source b) Drain
c) Gate d) Substrate

(vi) Recognize why RC coupling is confined to low-power applications.

a) Due to large value of coupling capacitor b) Low efficiency
c) Large number of components d) Due to is frequency response

(vii) In the drain characteristics of an FET, select which parameter is plotted on the x-axis.

a) Gate-source voltage b) Drain current
c) Drain-source voltage d) Gate current

(viii) Predict which region of operation is represented by the flat portion of the transfer characteristics curve for an FET.

a) Saturation
b) Cutoff
c) Active
d) Reverse bias

(ix) State which of the following expressions depicts Barkhausen criteria.

a) $A\beta = 1$
b) $A\beta = 0$
c) $A\beta > 1$
d) $A\beta < 1$

(x) Identify the purpose of the load line in FET drain characteristics.

a) To provide feedback
b) To set the bias point
c) To amplify the signal
d) To control the gate voltage

(xi) In an N-channel FET, if V_{GS} is positive, then determine the FET is operating in which mode.

a) Cut-off
b) Saturation
c) Enhancement
d) Depletion

(xii) Define $V_{GS(th)}$ in an FET.

a) Voltage at the gate-source terminal
b) Threshold voltage for gate-source conduction
c) Voltage at the drain-source terminal
d) Threshold voltage for drain-source conduction

(xiii) Indicate the interconnecting relationship between V_{DS} and V_{GS} for the saturation region of an FET.

a) $V_{DS} = V_{GS}$
b) $V_{DS} < V_{GS}$
c) $V_{DS} > V_{GS}$
d) $V_{DS} = 0$

(xiv) In a JFET, determine which region is responsible for controlling the flow of current.

a) P-region
b) N-region
c) Depletion region
d) Substrate region

(xv) Determine the key physical principle behind the operation of a JFET.

a) Photoelectric effect
b) Electromagnetic induction
c) Electron tunneling
d) Electric field control of current

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain Op-amp characteristics. (3)

3. Define the MOSFET. (3)

4. Calculate I_E in a transistor for which $\beta = 50$ and $I_B = 20\ \mu A$. (3)

5. Explain voltage-controlled voltage source. (3)

6. A JFET has a drain current of 5 mA. If $I_{DSS} = 10$ mA and $V_{GS\ (off)} = -6V$, solve the value of (i) V_{GS} and (ii) VP. (3)

OR

Fig. 1 shows the transfer characteristic curve of a JFET. Write the equation for drain current. (3)

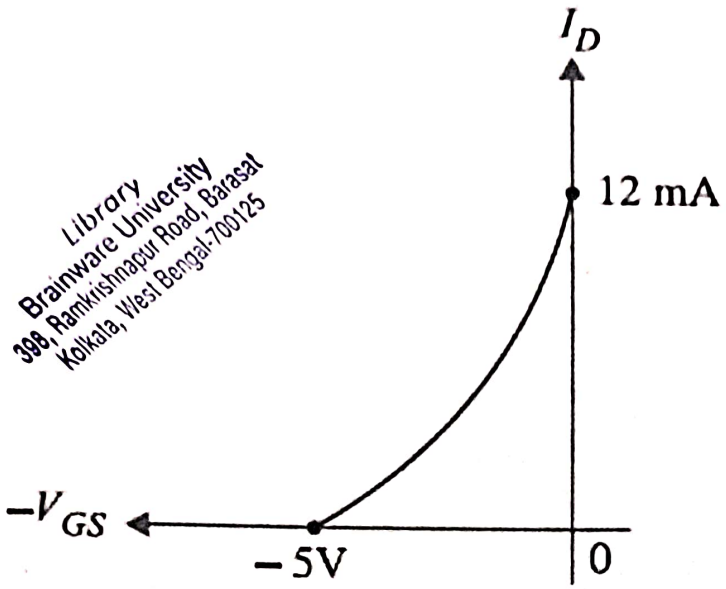


Fig.1

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Explain the differentiator circuit by using OP-AMP. (5)

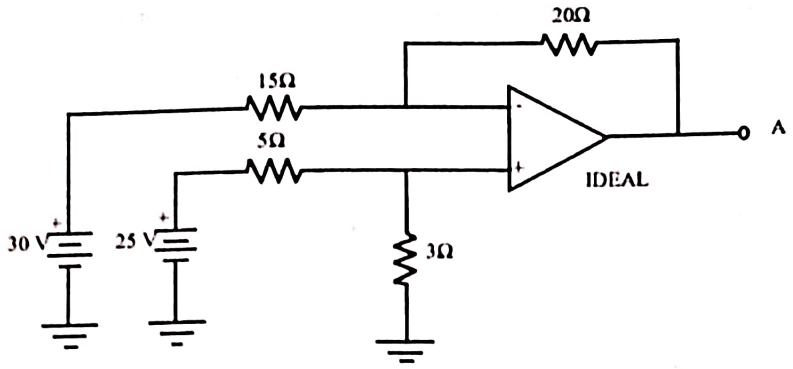
8. Describe the transistor voltage-divider bias. (5)

9. For a certain transistor, I_B = 20 μA, I_C = 2 mA, and β = 80. Calculate the value of I_{CBO}. (5)

10. Write about the drain characteristics of JFET. (5)

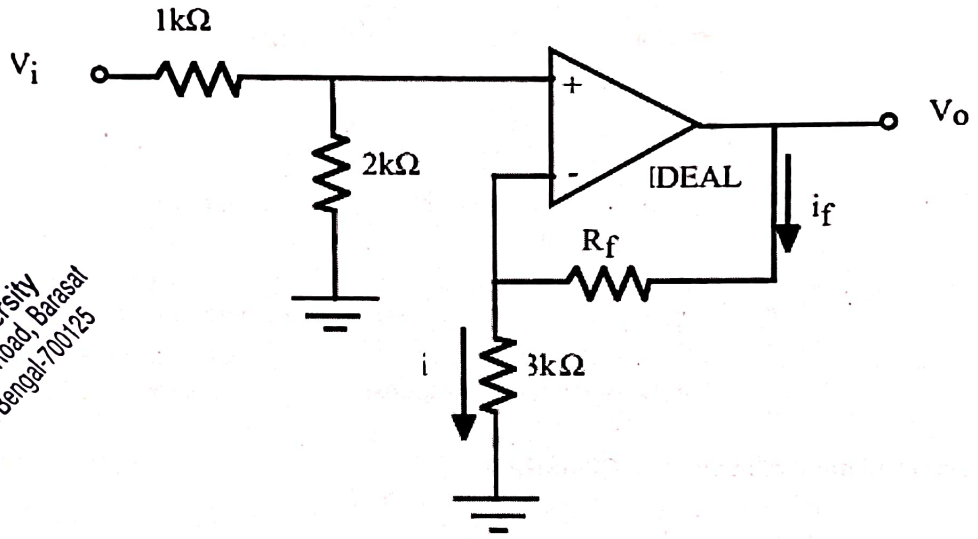
11. Describe the inverting OPAMP. (5)

12. For the difference amplifier circuit shown, solve the output voltage at terminal A. (5)



OR

For the ideal op amp shown, justify the value of resistor R_f to obtain a gain of 5. (5)



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