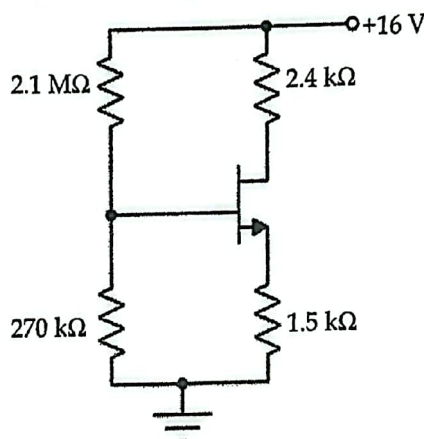


Exam.	Back (New Course)		
Level	BE	Full Marks	60
Programme	BEI, BCT	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Electronics Device and Circuit (ENEX 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Why BJT is bipolar and FET is unipolar? Design β -independent type DC biased common collector amplifier. Given parameters are: $V_{CC} = 20\text{ V}$, $I_C = 2\text{ mA}$, and $\beta = 100$. Use firm biasing method. [1+5]
2. Explain the role of bypass capacitor in amplifier circuits. Draw the small signal equivalent circuit of a common base amplifier circuit and find its input impedance, output impedance and voltage gain. [2+5]
3. Describe the construction and working principle of N Channel D-MOSFET with the help of characteristic curves and mathematical expressions. [6]
4. Find I_D and V_{DS} for the given circuit. Given parameters: $V_P = -4\text{ V}$ and $I_{DSS} = 8\text{ mA}$. [7]



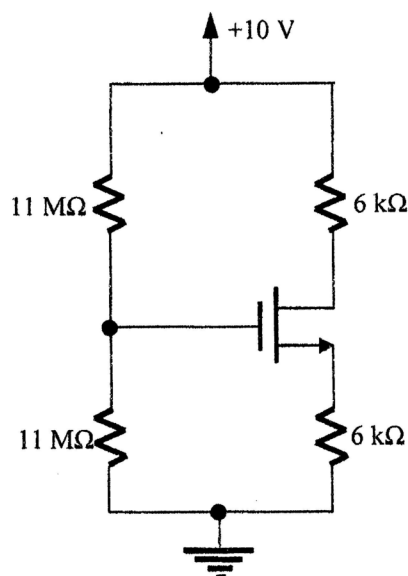
5. What is the main difference between RC and LC oscillator circuits in terms of application? Explain the operation of Wien Bridge Oscillator circuit with the help of circuit diagram and necessary mathematical expressions. [1+5]
6. Explain how a base current compensation circuit reduces the difference between I_O and I_{REF} in a simple current mirror circuit. [5+2]
7. For a class B amplifier providing a 20 V peak signal to a $16\ \Omega$ load (speaker) and a power supply of $V_{CC} = 30\text{ V}$, determine the input power, output power, and circuit efficiency. [6]
8. Draw the circuit diagram and the characteristic curve of a transformer-coupled class A amplifier and derive its general and maximum efficiency. [7]
9. Derive the expression for stability factor of a discrete-transistor series regulator. [4]
10. Design a variable DC voltage regulator using the LM317 to output (3-15) volts. [4]

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BEI, BCT	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Electronics Device and Circuit (ENEX 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is the significance of β -independency in a voltage divider biasing circuit? Design a β -independent voltage divider bias circuit for the given parameters: $V_{CC} = 15\text{ V}$, $I_E = 1\text{ mA}$ and $\beta = 100$. [1+5]
2. Explain the role of coupling capacitors in amplifier circuits. Draw the small signal equivalent circuit of a common emitter amplifier circuit and find its input impedance, output impedance and voltage gain. [2+5]
3. Describe the construction and working principle of n-channel JFET with the help of characteristic curves and mathematical expressions. [6]
4. Find I_D and V_{DS} for the circuit shown in the figure below. Given parameters are: $V_t = 1\text{ V}$ and $K = 0.48\text{ mA/V}^2$. [7]



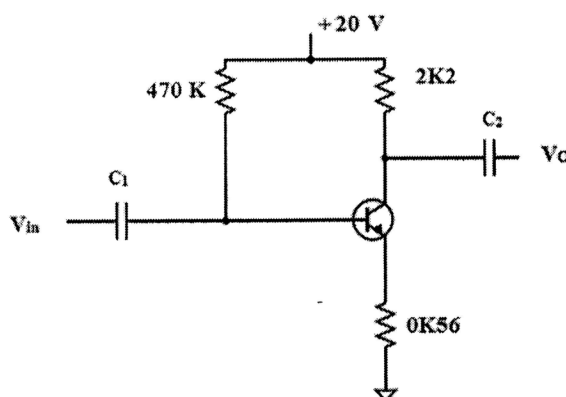
5. State Barkhausen criteria for sinusoidal oscillation. Explain the working principle of RC phase shift oscillator with necessary expression and circuit diagram. [6]
6. With a neat circuit diagram and necessary mathematical expressions, explain the operation of Widlar current source. What is the advantage of Widlar current source over simple current source? [5+2]
7. Draw the circuit diagram of transformer coupled Class B amplifier. Determine the condition for minimum efficiency of Class B amplifier. [6]
8. Define crossover distortion in a class B amplifier and explain how class AB operation can be used to eliminate it. [6]
9. Explain the working principle of a series transistor voltage regulator, accompanied by short-circuit/overload protection. [5]
10. Design a 10-25 V variable DC voltage regulator using LM317 IC. [4]

Exam.	Back (New Course)		
Level	BE	Full Marks	60
Programme	BEI, BCT	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

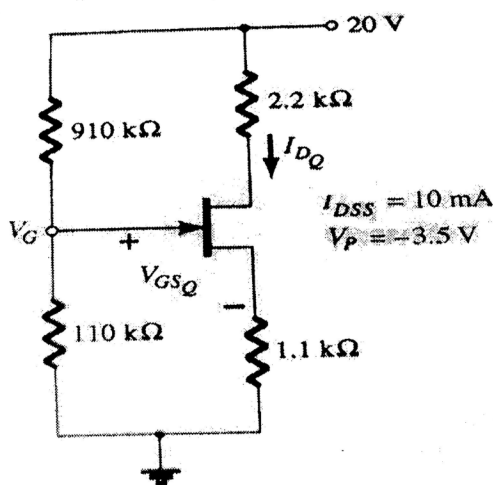
Subject: - Electronic Device and Circuit (EX 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- Design a β -independent voltage divider bias circuit using the appropriate guidelines for the given parameters: $V_{CC} = 12\text{ V}$, $I_E = 1\text{ mA}$, and $\beta = 100$. [4]
- Determine input resistance, voltage gain and output resistance of given common emitter BJT Amplifier. $\beta = 120$ and $r_o = 40\text{ k}\Omega$. [5]



- Explain the operation principle of a BJT as a switch with the necessary diagrams. [4]
- Describe the construction and working principle of n-channel depletion type MOSFET with the help of characteristics curve and mathematical expressions. [7]
- For the given JFET voltage divider configuration, determine I_{DQ} , V_{GSQ} , V_{DS} and transconductance g_m . [6]



- Draw circuit diagram of LC Hartley oscillator. Derive its frequency of oscillation. [4]
- Derive the expression of bandwidth of class A tuned amplifier. [4]
- Show that the voltage gain of the differential amplifier with active load is twice that with passive load. [5]
- Derive general efficiency of series fed class A amplifier. [4]

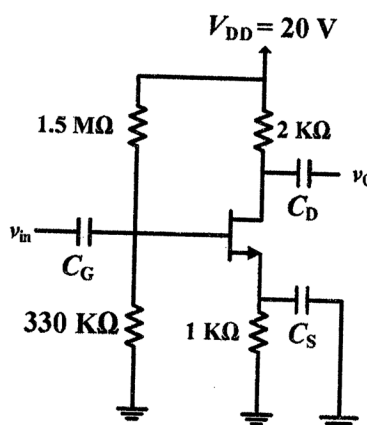
10. For a class B amplifier using a supply of $V_{CC} = 30 \text{ V}$ and driving a load of 16Ω , determine the maximum input power, maximum output power and maximum power dissipation at transistors. [5]
11. Derive frequency of oscillation of 555 timer Astable Multivibrator [4]
12. Draw series voltage regulator with current limiting circuit and explain how this protection circuit works. Design a voltage regulator to give output voltage from 5 V to 15 V using LM317. [4+4]

Exam.	Regular (New Course-2080 Batch)		
Level	BE	Full Marks	60
Programme	BEI, BCT	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Electronics Device and Circuit (EX 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

- Design β independent type dc biased common emitter amplifier. Given parameters $V_{CC} = 20$ V, $I_C = 1.5$ mA and $\beta = 110$. Use stiff biasing method. [4]
- Why is a common collector BJT amplifier also known as an emitter follower? Draw the small signal model of common collector amplifier circuit and derive expressions for input resistance, voltage gain, and current gain. [1+4]
- Derive trans-conductance of BJT. [4]
- Describe the construction and working principle of n channel enhancement-type MOSFET with the help of necessary diagrams and its drain characteristic curve. [7]
- Find I_D and V_{DS} for the following circuit. Given data are $V_P = -5.5$ V, $I_{DSS} = 10$ mA. Assume all the capacitors are ideal and check whether the transistor is operating in the Pinch off region or not. [6]



- State Barkhausen criterion for sinusoidal oscillation. Draw the circuit diagram of Colpitts oscillator and write its frequency of oscillation. [4]
- Derive frequency of oscillation of 555 timer Astable Multivibrator. [4]
- Draw a Widlar Current Source. Derive an expression for an output resistance of Widlar Current Source. [5]
- Calculate the efficiency of a transformer coupled Class A amplifier for a supply of 12 V DC and output of $V_P = 12$ V and 6 V. [4]
- Draw the circuit diagram and the characteristic curve of a transformer coupled class B push-pull amplifier and derive its general efficiency. [5]
- Draw the circuit diagram of class A tuned amplifier with its frequency response. Derive its 3dB bandwidth. [4]
- Design variable DC voltage regulator using LM 317 to get (10-20) volts output. [4]
- Explain the working principle of a series transistor voltage regulator with improved performance and derive an expression for the voltage stability. [2+2]