TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

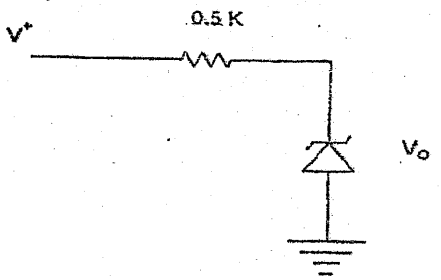
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BEI, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

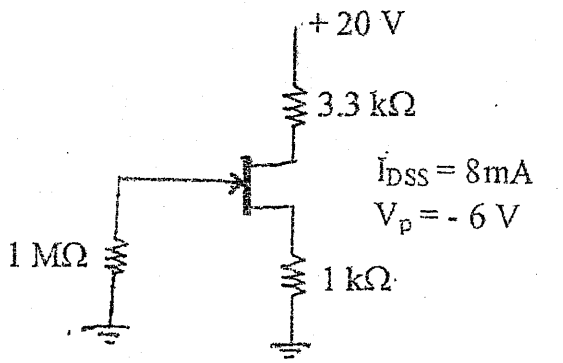
Subject: - Electronic Devices and Circuits *(EX 501)*

- ✓ 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. Define Q-point in pn junction diode operation. Show it graphically with necessary derivations. Differentiate between avalanche and zener break down. [3+2]
2. The 6.8 V zener diode is specified to have Vz = 6.8 V at Iz = 5 mA, rz = 20Ω and Izk = 0.2 mA. The supply voltage V^+ is nominally 10V but can vary by ± 1V. Find V_0 with no load and with V^+ at its nominal value. Find the change in V_0 resulting from connecting a load resistance RL that draws a current I_L = 1 mA. What is the minimum value of R_L for which the diode still operates in the breakdown region? [2+1+2]



3. Design β independent type dc biased common collector amplifier, and find its current gain and input resistance. Given parameters: V_{CC} = 20 VDC, I_C = 2mA and β = 100 and use firm biasing method. [8]
4. Draw common emitter transistor amplifier circuit (emitter bias with unbypassed emitter capacitor) and find its output impedance and voltage gain. Write application of common base amplifier. [4+3+1]
5. Describe the working principle of N-channel Depletion type MOSFET with the help of I_D V_S V_{DS} characteristics and transfer characteristics curves. Find the condition and expression for it to operate in active mode of operation and write the expression for drain current. [5+2+1]
6. Write about JFET as a voltage controlled resistor with practical application. [4]
7. Find I_{DQ} and V_{GSQ} from the following circuit. [5]



8. Draw the circuit diagram of class A series fed amplifier and its corresponding characteristic graph. And, find its general efficiency. [3+3]
9. Draw the circuit diagram of Complementary-Symmetry class-AB amplifier using Darlington pair transistors. [3]
10. Describe about tuned amplifier and derive the expression for the 3dB bandwidth of the amplifier. [5]
11. Differentiate between synchronous and stagger turned amplifier. [3]
12. Draw voltage controlled oscillator circuit using IC 555 and derive expression for frequency of oscillation. [6]
13. Among Hartley and Colpitts LC oscillator, which one do you choose to implement in FM stations to generate carrier wave signal? Why? Draw its circuit diagram. [5]
14. Draw the standard series DC voltage regulator circuit and find its voltage stability factor(S_v). [5]
15. Design a 5V to 20V variable dc voltage regulator using IC LM317. [4]

***

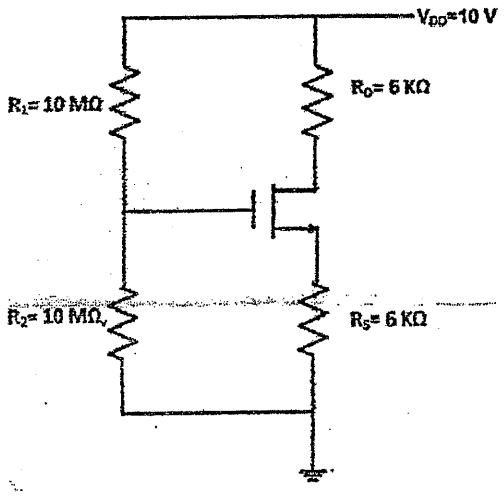
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electronic Devices and Circuits *(EX 501)*

- ✓ 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. Find the operating point of the diode circuit graphically using load line method. [5]
2. Design DC voltage regulator for 6V output. Given data are V_2=6V at I_z=20mA, I_{zk}=2mA, P_{zmax}=500mW and rz=10Ω. The nominal input voltage is 15V+30% DC. Find the maximum current it can deliver to the load. [5]
3. Design a common base amplifier circuit using β independent method. Given parameters are V_{cc}=15V, I_E=1.5mA, β=100 and input and output impedances are comparatively large. Use appropriate guideline to support your design. [7]
4. Why common collector amplifier is known as emitter follower? Draw its ac equivalent circuit to find its input resistance and voltage gain. [1+6]
5. Draw and describe the Ebers Moll model for BJT. [4]
6. Draw the cirucuit diagram of the Colpitts Oscillator and derive its frequency of Oscillation. [6]
7. Find the drain current (I_D) and drain to source voltage (V_{DS}) for the following circuit. Given parameters are: V_t=1 V and k=0.5 mA/V^2. [7]



8. Describe the construction and working principal of N-channel JFET with the help of characteristics curve and mathematical expression. [7]

9. Define crossover distortion in class B amplifier. Draw quasi-complementary symmetry class AB amplifier. And explain how crossover distortion is eliminated in class AB amplifier. [7]

10. Draw the circuit diagram of Class A tuned amplifier and determine the range of frequency in which it gives maximum gain within 3 dB range? [6]

11. Design a DC voltage regulator for 3V to 12V output using LM317. [5]

12. Define the term multivibrator. Explain the operation of op-amp based astable multivibrator for square wave with the help of circuit diagram and waveforms and also determine its frequency of oscillation. [8]

13. Draw the standard series DC voltage regulator circuit and find its voltage stability factor(S_v). [6]

***

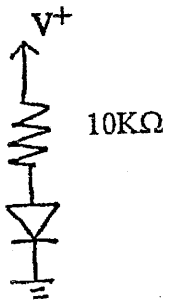
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT.	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

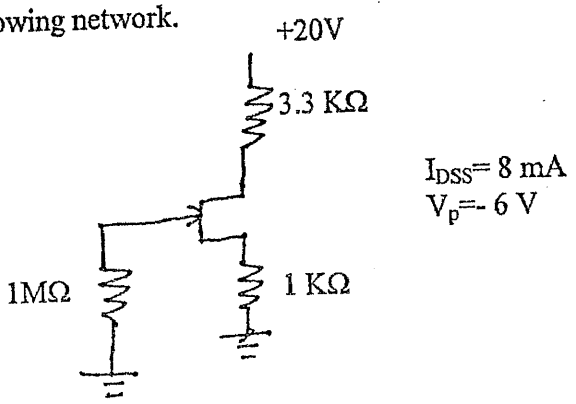
Subject: - Electronic Devices and Circuits *(EX 501)*

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

1. Differentiate between avalanche and zener breakdown. Draw V-I characteristic curve of zener diode and briefly explain about it. [3+2]
2. In the given circuit, the power supply V^+ has a dc value of 10V on which is super imposed a 50 Hz sinusoid of 1V peak amplitude. Calculate both the dc voltage of the diode and amplitude of the sine-wave signal appearing across it. Assume the diode to have a 0.7V at 1 mA current and η=2. [5]



3. Design β independent type of dc biased common collector amplifier, and find its voltage gain and input resistance. Given parameters: V_{cc}= 20 VDC, I_c=2mA and β=100 and use firm biasing method. [8]
4. Describe in brief the operation of BJT as a switch in cut off and saturation region. [4]
5. Explain about working principle of N-channel DMOSFET with its construction, characteristics curves and characteristic equation. [7]
6. For the faithful amplification of signal, selection of operating point is utmost importance. Justify the above statement. Derive transconductance of bipolar junction transistor. [3+4]
7. Determine Q point for the following network. [7]



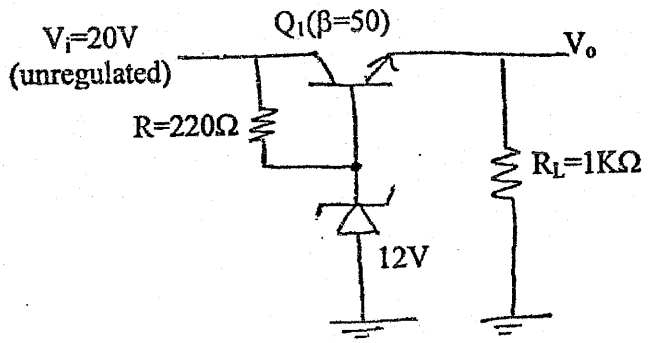
8. Draw the circuit diagram of the Hartley Oscillator and derive its frequency of oscillation. [6]

9. Draw the circuit diagram of class A series fed amplifier and its corresponding characteristics graph. And find its general efficiency. [3+3]

10. Explain about the operation of voltage controlled oscillator (VCO) using 555 timer IC and derive its frequency of oscillation. [8]

11. Draw the circuit diagram of Complementary-Symmetry Class-AB amplifier using Darlington pair transistors. [3]

12. Calculate the output voltage and the zener current in the regular circuit as shown in figure below for R_L=1 KΩ and R=220Ω. V_Z=12V. [5]



13. Draw series voltage regulator with current limiting circuit and explain how this protection circuit works? [6]

14. Briefly explain about Precision half wave rectifier with circuit diagram. [3]

***

16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

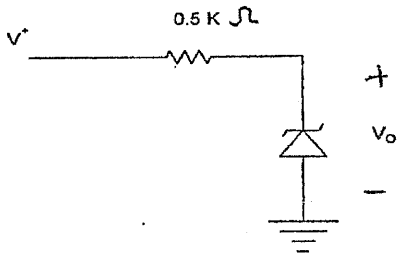
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electronic Devices and Circuits *(EX501)*

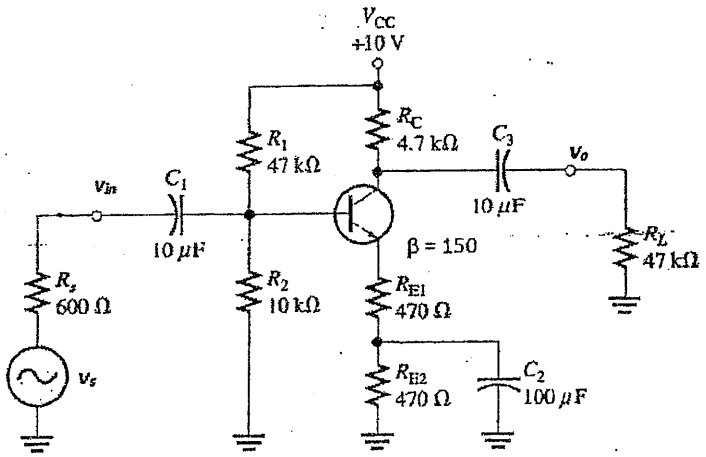
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. The leakage current of a silicon diode is $I_S = 10^{-9}$ A at 25°C, and the emission coefficient is $\eta = 1.6$. The operating junction temperature is $T_j = 60°C$. Determine (i) the leakage current I_S and (ii) the diode current I_D at $V_D = 0.8$ V. [4]

2. The 6.8V zener diode is specified to have Vz = 6.8 V at Iz = 5 mA, $r_z = 20\ \Omega$ and $I_{zk} = 0.2$ mA. The supply Voltage V^+ is nominally 10 V but can vary by ± 1V. Find V_0 with no load and with V^+ at its nominal value. Find the change in V_0 resulting from connecting a load resistance R_L that draws a current $I_L = 1$ mA. What is the minimum value of R_L for which the diode still operates in the breakdown region? [2+2+2]



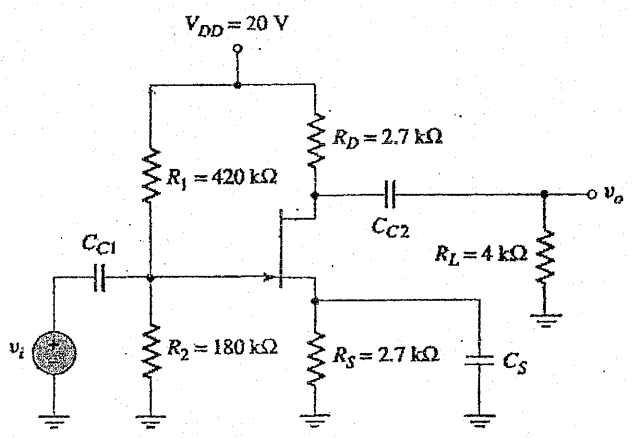
3. Determine the input resistance, output resistance and overall voltage gain of the circuit given below: [8]



4. Find terminal currents of BJT using Ebers-Moll Model. Write applications of different BJT configurations. [5+3]

5. Explain the construction and operation of D-MOSFET with characteristics curve and mathematical expression. [8]

6. Find the DC operating point of JFET circuit given below. Given parameters I_{DSS} = 12 mA and V_P = -4V. [8]



7. Derive maximum efficiency of series fed class A amplifier. [6]
8. Derive bandwidth of tuned amplifier. Write its applications. [6]
9. For a class B amplifier providing a 14V peak signal to 16 Ω load and a power supply of V_{cc} = 24V, determine input power, output power and circuit efficiency. [4]
10. Draw voltage controlled oscillator circuit using IC 555 and derive expression for frequency of oscillation. [6]
11. Draw the circuit diagram of half wave precision rectifier and explain the operation. [4]
12. Define voltage regulator. Explain the series voltage regulator with current limiting element. [1+5]
13. Explain working principle of WIEN BRIDGE oscillator with necessary expressions and circuit diagram. [6]

***

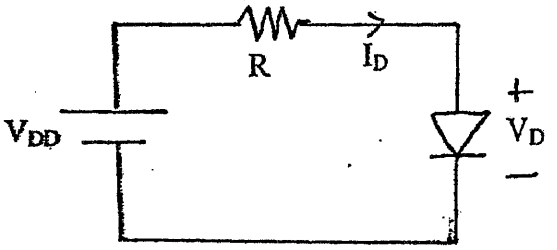
16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT, BEL	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

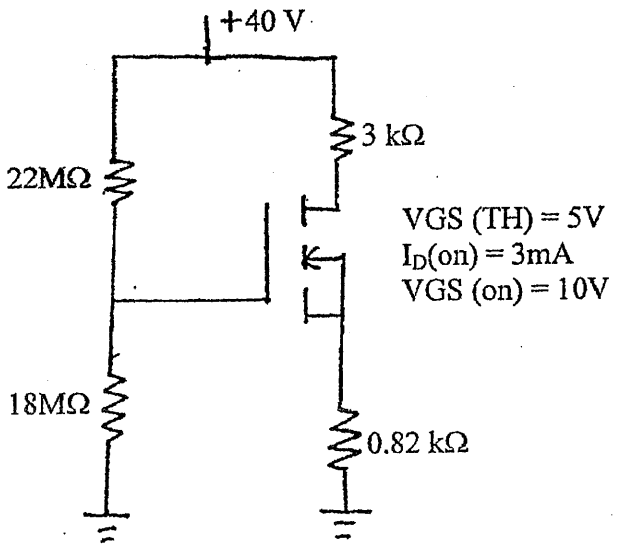
Subject: - Electronic Devices and Circuits *(EX501)*

- ✓ 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. Derive the **expression** for dynamic resistance of pn junction diode. [5]
2. Determine **the current** I_D and the diode voltage V_D with V_{DD}=5 V and R= 1KΩ. Assume that the **diode has a** current of 1 mA at a voltage of 0.7 V and that its voltage drop changes by **0.1 V for** every decade change in current. [5]



3. Design **voltage divider** biased common emitter BJT amplifier to get voltage gain of -90. Assume β= **100 and** Vcc=+12V. [8]
4. Derive **input impedance**, output impedance and voltage gain of common collector BJT amplifier . [8]
5. Explain the **construction** and operation of E-MOSFET with characteristics curve and mathematical **expression**. [7]
6. Derive **mathematical** definition of JEFET transconductance. [4]
7. Find I_{DQ} and V_{DSQ} **from** the following circuit. Show Q point graphically. [5+3]



8. Derive general efficiency of class B amplifier. [5]
9. Draw the circuit diagram of Darlington complementary-symmetry class AB amplifier using diodes. [3]
10. Derive maximum efficiency of transformer coupled class A amplifier. [5]
11. Draw astable multivibrator circuit using IC 555 and derive expression for frequency of oscillation. [6]
12. Explain working principle of RC phase shift oscillator with necessary expressions and circuit diagram. [6]
13. Explain the operation of voltage regulator using band gap voltage reference. [6]
14. Design a (5-15)V variable dc voltage regulator using LM 317 IC. [4]

***

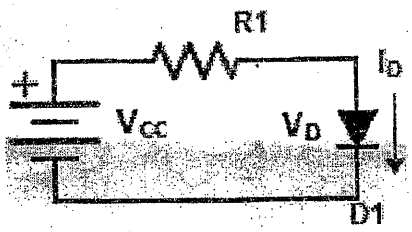
26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL,BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electronic Device and Circuits *(EX501)*

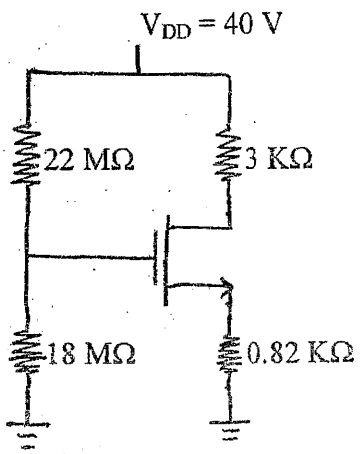
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Scientific calculator is allowed.*
- ✓ *Assume suitable data if necessary.*

1. In the circuit given below, the DC power supply V_{cc} = 10 V is superimposed with 60 Hz sinusoid of 1 V_{pp} amplitude. Calculate the amplitude of the sine wave signal appearing across the diode for the case R1 = 10 KΩ. Assume the constant voltage drop of 0.7 V in the diode. [5]



2. Define and explain reverse breakdown effect. Describe how Zener diode works as a voltage regulator. [2+3]
3. Why voltage divider biasing is called β independent? Design CE amplifier using β independent dc biasing method with appropriate guideline. [3+5]

   Given: V_{CC} = 24 V, I_{BQ} = 10μA and β = 100
4. What is the significance of bypass capacitor in CE amplifier? Draw the small signal model for capacitor bypassed CE amplifier circuit and find its input impedance, output impedance and voltage gain. [2+6]
5. Describe the principle of operation of operation of N channel Depletion type MOSFET with the help of mathematical expression and drain characteristics graphs. [8]
6. Determine I_D and V_{DS} for the given circuit and find the region of its operation. Given: $k = 0.12 mA/V^2$ and V_t = 5 V. [6+2]



7. Explain the operation of transformer coupled class B push-pull amplifier with the proper circuit diagram and characteristics curve. Also determine its maximum efficiency. [4+4]
8. Explain why class A amplifier is cooler with load than without load. [6]
9. State Barkhausen criteria. Draw the circuit diagram of RC phase shift oscillator and derive the expression for its frequency of oscillation. [2+5]
10. Describe the operation of precision half wave rectifier with circuit diagram. [5]
11. Describe the operation of a series voltage regulator with current limiting circuit. [7]
12. Design a 5.2 V to 13 V variable DC voltage regulator using IC LM 317. [5]

***

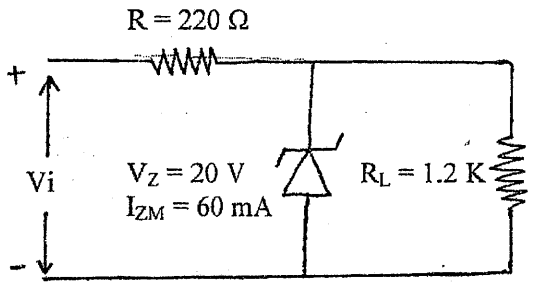
26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

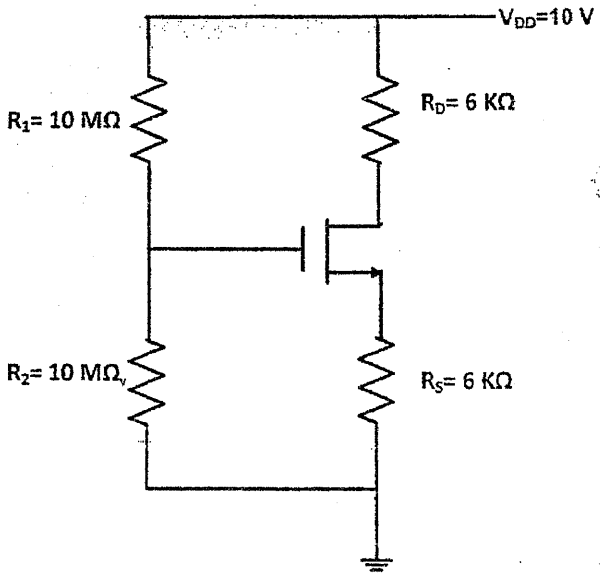
Subject: - Electronic Device and Circuits *(EX501)*

- ✓ 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**.*
- ✓ *Scientific Calculator is allowed.*
- ✓ *Assume suitable data if necessary.*

1. Explain the small signal model of PN junction diode and drive its dynamic resistance. [2+4]
2. Determine the range of values of V_i that will maintain the Zener diode of figure below in ON state. [5]



3. Design β independent type DC biased common emitter amplifier with emitter resistance bypassed and find its voltage gain and input resistance. Given parameters V_{cc} = 24, I_C = 2 mA, β = 90. Use appropriate guideline to have high input resistance. [8]
4. Describe in brief the operation of BJT as a switch in cut off and saturation region. [6]
5. Define transconductance (g_m). Derive g_m for BJT. [1+3]
6. Explain the construction and operation of N channel enhancement type MOSFET with the help of drain characteristics and transfer characteristics. [8]
7. Find the drain current (I_D) and drain to source voltage (V_{DS}) for the following circuit. Given parameters are: V_t = 1 V and k = 0.5mA/V^2. [6]



8. State the difference between BJT and FET. [2]
9. What is crossover distortion? Explain how it can be eliminated with necessary diagram. [2+4]
10. Draw the circuit diagram of tuned amplifier and derive the expression for the 3dB bandwidth of the amplifier. [6]
11. Define Barkhausen criteria for sinusoidal oscillation. Draw the circuit diagram of wien bridge oscillator and determine its frequency of oscillation. [2+6]
12. Describe Colpitt's oscillator with necessary circuit diagram. [5]
13. Draw the standard series DC voltage regulator circuit and find its voltage stability factor (S_V). [6]
14. Design a 3.7 to 9V variable dc voltage regulator using IC LM317. [4]

***

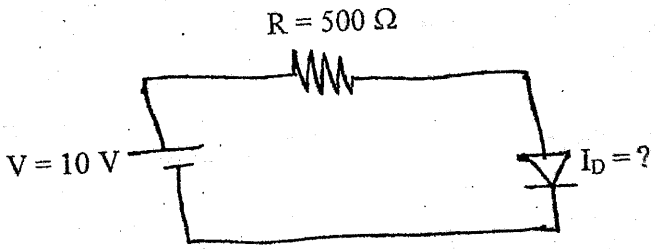
26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

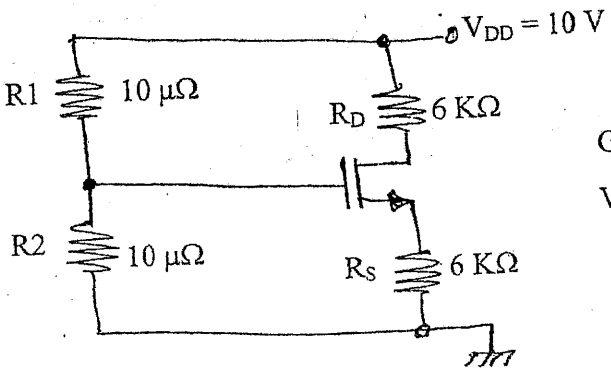
Subject: - Electronic Devices and Circuits *(EX501)*

- ✓ 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. In the given circuit, the diode used has its n = 1.74 and it conducts 1mA at forward bias voltage of 0.7 V. Find the current flow in the circuit. [4]



2. Design DC voltage regulator for 6V output. Given data are V_z = 6 V at I_Z = 20 mA, I_{2k} = 2mA, P_{Zmax} = 500 mw and r_Z = 10Ω. The nominal input voltage is 15V ± 30% DC. Find maximum current it can delivers to the load. [4]
3. Design β independent type dc biased common collector amplifier and find its current gain and input resistance. Given parameters are: V_{CC} = 20 V, I_C = 2 mA and β = 100. Use firm biasing method. [8]
4. Draw the small signal model circuit for capacitor unbypassed CE amplifier and find its voltage gain and current gain. [8]
5. Describe the construction and working principle of N-channel JFET with the help of its drain characteristics curve and necessary mathematical expressions. [6]
6. For the circuit given below, find I_D and V_{DS}. Also determine its region of operation and small signal ac equivalent circuit. [3+3+2+2]



Given data are:
$V_t = 1\ V, k = 0.5 \frac{mA}{V^2}$

01/~~08~~ 09

7. Draw the circuit diagram of transformer coupled class B push pull amplifier and its corresponding characteristic graph. And from graph prove that maximum efficiency is equal to 78.5%. Also find the condition when it has maximum loss. [3+3+3+3]
8. Draw the circuit diagram and its frequency response graph of LRC tuned class A amplifier. State its resonance frequency and band width (3dB). [1+1+1+1]
9. State Barkhausen criteria for sinusoidal oscillator. Is this principle applicable to RC oscillator using op-Amp? Why? If yes, determine the frequency of oscillations and the gain of the amplifier of the circuit. [2+1+4]
10. Explain the operation of AMV using555 IC and derive its frequency of oscillation. [6]
11. Describe the bandgap voltage reference source with the help of a relevant circuit. Compare bandgap voltage reference source with zener diode. [4+2]
12. Draw the series dc voltage regulator with current limiting element and explain how it works. [5]

***

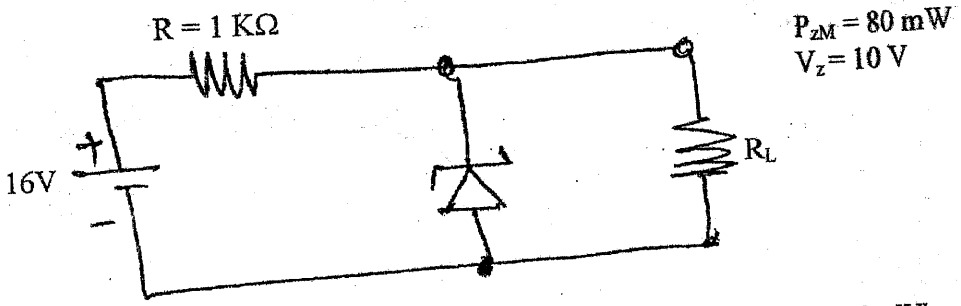
25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

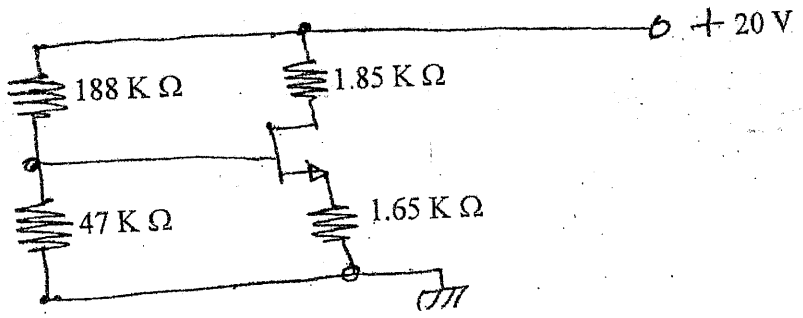
Subject: - Electronic Devices and Circuits *(EX501)*

- ✓ 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. Find operating point for the diode circuit graphically using load line method. [4]
2. Find the zener current form the given circuit if (i) $R_L = 1.2\ K\Omega$ (ii) $R_L = 3\ K\Omega$ [4]



3. Determine the input resistance and output resistance of CC BJT amplifier circuit. Why common collector configuration is used in amplifier circuit design. [2+2+2+2]
4. Describe the operation of BJT as switch with the help of Non-gate circuit. [4]
5. Derive expressions to obtain transconductance for BJT, JFET and MOSFET. Also prove that $\gamma_\pi = (\beta+1)\gamma_e$ [8]
6. The n-channel JFET in the figure below has I_{DSS} = 18 mA and V_p = -5V. Determine the values of I_D and V_{DS}. [8]



7. Describe the working principle of N-channel EMOSFET with the help of its drain characteristics curve and necessary mathematical expressions. [6]

8. Determine the general efficiency of transformer coupled class B push pull amplifier. Draw the circuit diagram and its graph. [4+4]
9. Explain how class AB amplifier eliminates the cross over distortion. [3]
10. Draw the circuit diagram of LRC tuned class A amplifier and its frequency response graph and show that Bandwidth = $\frac{1}{RC}$. [3+3]
11. Explain the operation of AMV using 555 timer IC and derive its frequency of oscillation. [6]
12. Draw the circuit diagram of Hartley oscillator. [3]
13. Draw standard dcV regulator circuit and find its voltage stability factor. [4+4]
14. Design a DCV regulator for 3.7 V to 12 V output using LM317. [4]

***

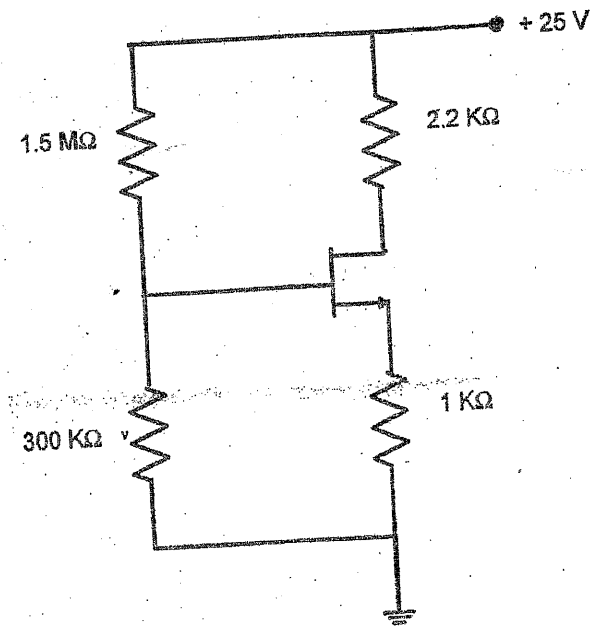
25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL,BEX,BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electronic Devices and Circuits *(EX501)*

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

1. What is p-n junction diode? Explain the large signal models of p-n junction diode. [1+4]
2. Find the value of dynamic resistance if voltage in the diode is 650mv and I_{RS} is 10pA= (10×10^{-12}A) (Given n = 2 and V_t = 25 mV) [5]
3. Why common collector amplifier is also called emitter follower? Draw the common collector transistor amplifier circuit and find its input impedance, output impedance and voltage gain. [8]
4. Draw and describe the Ebers Moll model for BJT. [4]
5. Describe in brief the operation of BJT as a switch in cut off and saturation region. [4]
6. Describe the construction and working principle of EMOSFET with help of drain characteristics curve and mathematical expressions. [8]
7. Find I_D and V_{DS} for the given circuit. The given data are V_p = -4V and I_{DSS} = 10mA [5]



8. Derive an expression to obtain the transconductance of JFFT. [3]
9. What is the maximum efficiency of class B amplifier? State the condition when it occurs. [4]
10. When are tuned amplifiers used? Draw class A tuned amplifier circuit and find its 3db bandwidth. [2+5]

11. Draw the circuit diagram of Complementary-Symmetry Class-AB amplifier. Using Darlington pair transistors. [3]

12. Write the applications of tuned LC oscillators. Draw the Colpitt's oscillator circuit and derive the expression for frequency of oscillation. [6]

13. Draw AMV circuit using IC 555 or BJT. [4]

14. State Barkhausen Criteria for sine wave oscillator. [2]

15. Design a (10-25) V variable dc series voltage regulator using LM 317 IC. [5]

16. Draw the circuit of current limiting circuit in dc voltage regulator. [2]

17. Find voltage stability factor of series dc voltage regulator. [5]

***

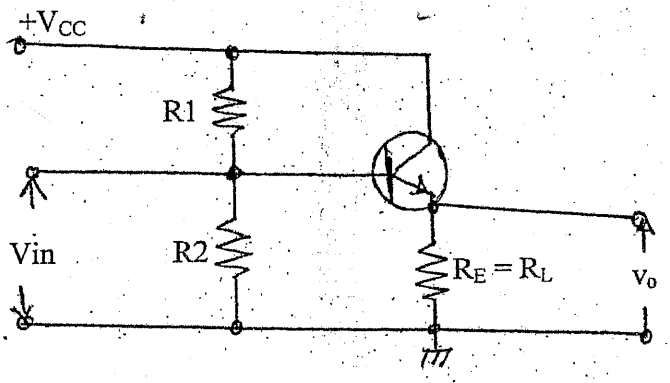
26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

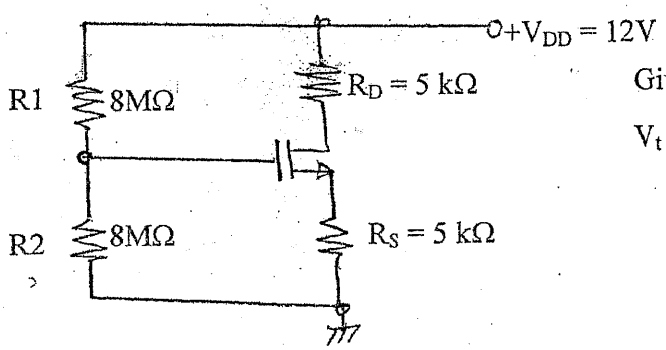
Subject: - Electronic Devices and Circuits *(EX501)*

- ✓ 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. Draw graphs of IV characteristics of ordinary PN junction diode and zener diode. Draw ac equivalent model for PN junction diode and derive its dynamic resistance. [2+4]
2. A diode conducts 1mA at 20°C. If it is operated at 100°C, what will be its current? Given data are $\eta = 1.6$ and negative temperature coefficient value = -2.2 mV/°C. [4]
3. Design voltage divider bias (common emitter configuration) to get $I_{CQ} = 1.5$ mA. Assume power supply voltage VCC = 15 V and beta of transistor is 110. [8]
4. Derive Expressions for Ai, Rin and Rout. [6]



5. Describe the operation of JFET in ohmic and active regions of operations with the help of graph and expressions. [8]
6. Find the value of I_D and V_{DS} in the given circuit. [6]



Given parameters:
$V_t = 1V$, $k = 0.5 \frac{mA}{V^2}$

7. Draw the circuit diagram of class A series fed amplifier and its corresponding characteristic graph. And, find its general efficiency. [3+3]

8. Draw the circuit diagram of transformer coupled class B push-pull amplifier. And show that the maximum efficiency is $25\pi\%$. [2+4]
9. Draw the circuit diagram of Complementary-Symmetry class-AB amplifier. [3]
10. Draw voltage controlled oscillator circuit using IC 555 and derive expression for frequency of oscillation. [6]
11. Explain working principle of Wein bridge oscillator with necessary expressions. [6]
12. Design a dc volatge regulator for V_o = 6V to 18 V. [4]
13. Draw the standard series DC voltage regulator circuit and find its voltage stability factor (S_v). [7]
14. Describe in brief the operation of BJT as a switch in cut off and saturation region. [4]

***

7/20

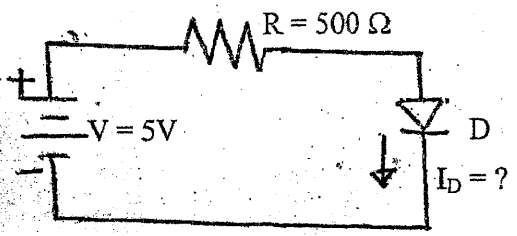
26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

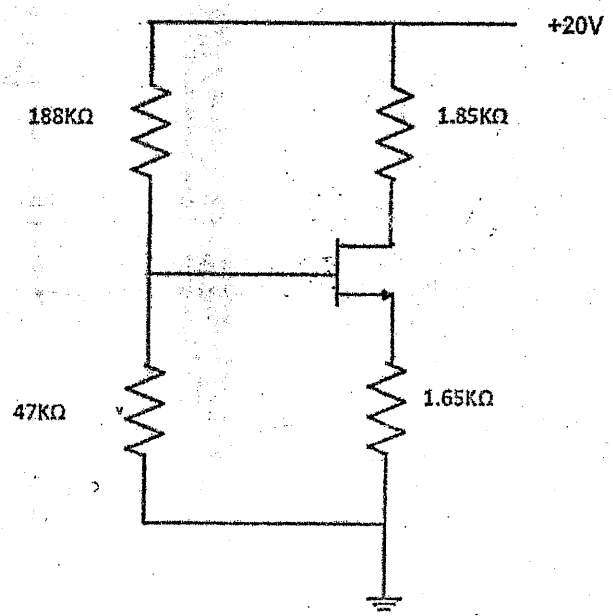
Subject: - Electronic Devices and Circuits *(EX501)*

- ✓ 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. In the given circuit, the diode used has its n = 1.74 and it conducts 1mA at forward bias voltage of 0.7 V. Find the current flow in the circuit. [6]



2. Draw unregulated dc voltage power supply using bridge rectifier. [2]
3. Describe functions of BJT as amplifier with the help of transfer characteristics (i_c - v_{BE} graph), and find expressions for g_m, r_π and r_e. Also show that $\beta = g_m r_\pi$ and $r_\pi = (\beta+1) r_e$. [6+2]
4. Draw common collector transistor amplifier circuit and find its input impedance, output impedance and voltage gain. [6]
5. Describe the construction and working principal of EMOSFET with the help of drain characteristics curve and mathematical expression. [6]
6. The n-channel JFET in the figure below has I_{DSS} = 18mA and V_P = -5V. Determine the values of I_D and V_{DS}. [8]



7. Describe the operation of class B amplifier and find the maximum efficiency of the amplifier. [4+4]
8. Draw class A tuned amplifier and its corresponding graph. And find its resonant frequency (ω_o) and 3dB band width (B). [6]
9. Describe AMV circuit using IC 555 and state its frequency of oscillation. [6]
10. Draw phase shift oscillator circuit and write its frequency of oscillation (f_o). [5]
11. Why transistor series regulator has lower efficiency? Explain the operation of voltage regulator using band gap voltage reference. [2+4]
12. Design a (5-10)V variable dc voltage regulator using LM 317 IC. [5]
13. Write short notes on: (any two) [2×4]
    a) Π-models of BJT and MOSFET
    b) ac equivalent circuit of common source amplifier using MOSFET
    c) BJT as switch

***

25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electronic Devices and Circuits *(EX501)*

- ✓ 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. Describe with the help of loadline and IV characteristics of the diode, a simple circuit that uses pn junction diode in forward biased state. [5]
2. Design DC voltage regulator for 6V output. Given data are $V_Z = 6V$ at $I_Z = 20$ mA, $I_{zk} = 2$ mA, $P_{ZMAX} = 500$ mW and $r_z = 20\Omega$. The nominal input voltage is 12v±20% DC. Find its voltage regulation factor and maximum current it can deliver to the load. [5]
3. Design Common Base Amplifier using β-independent dc biasing method. Use appropriate guideline to support your design. Given parameters are: $V_{CC} = 24$VDC, $I_C = 1$ mA and $\beta = 200$. Also find its voltage gain by using its ac equvalent circuit. [5+3]
4. Describe in brief the operation of BJT as switch in cut off and saturation region. [4]
5. Draw Ebers Moll model, low frequency ∏-model and simple T - model for BJT. [2+1+1]
6. Describe the principle of operation of N-channel JEET with the help of drain and transfer characteristics graphs and mathematical expressions. [8]
7. An n-channel JEET has a pinch-off voltage of -4.5V and $I_{DSS} = 9$ mA. At what value of V_{GS} will I_{DS} be equal to 3 mA? What is its g_m at this I_{DS}. [5]
8. Derive an expression to obtain transconductance of MOSFET. [3]
9. What is crossover distortion and how it can be eliminated? [4]
10. Draw a circuit diagram of tuned amplifier. Determine the range of frequency in which it gives maximum gain within -3dB range. [5]
11. Why the efficiency of class-A amplifier is low? Obtain the expression of the general efficiency of series fed class -A power amplifier circuit. [6]
12. Define Barkhausen Criteria for sinusoidal oscillation. Draw the circuit diagram of RC phase shift oscillator and derive its frequency of oscillation. [5]
13. Define the term multivibrator. Explain the operation of op-amp based astable multivibrator with the help of circuit diagram and waveform. [4]
14. Design a regulator circuit to obtain 16 VDC. Choose approximate values of the parameters. Input voltage is 25 VDC. [5]
15. Draw the series voltage regulator with current limiting element and explain how it works. [6]
16. Draw block diagram for IC voltage regulator. [3]

***

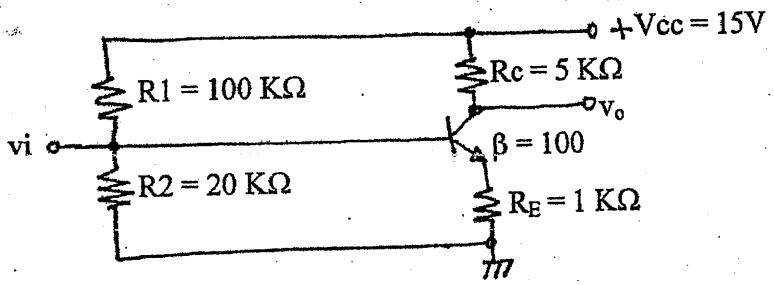
26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

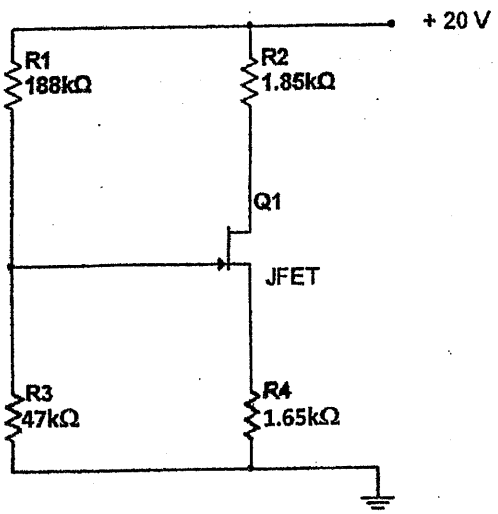
Subject: - Electronic Device and Circuits *(EX501)*

- ✓ 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. Draw full wave bridge rectifier circuit with 5 ohm load resistor connected at its output. If input ac voltage is 10V, calculate the power dissipation in the load resistor (Assume diodes operate at forward voltage of 0.7V). [4]
2. Explain the small signal model of PN junction diode and derive the expression for AC or dynamic resistance. [2+4]
3. Draw the ac equivalent circuit for given circuit and find its input and output resistances. Assume $\beta = 100$ for the BJT. [8]



4. Define transconductance (gm). Derive gm for BJT. [2+4]
5. Describe in brief the operation of BJT as a switch. [4]
6. Describe with necessary graphs and expressions the principle of operation of N-channel JFET. [6]
7. The n-channel JEET in the figure below has $I_{DSS} = 18$ mA and $V_P = -5V$. Determine the values of I_D and V_{DS}. [8]



8. State the difference between BJT and FET. [4]
9. Determine the general efficiency of Transformer Coupled Class-A power Amplifier. [6]
10. Draw the circuit diagram of Complementary-Symmetry Class-AB Amplifier. [2]
11. Calculate the efficiency of transformer coupled push pull Power Amplifier for a supply voltage of 20V and output of (i) $V_P = 20V$ (ii) $V_P = 16V$. [3+3]
12. Draw Wien Bridge Oscillator circuit and derive the expression for frequency of Oscillation and gain of the amplifier circuit. [2+3+3]
13. Draw standard series dc voltage regulator and find its voltage stability factor (S_v). [6]
14. Design a 4.2 V to 12 V variable dc voltage regulator using IC LM317. [4]
15. Draw the circuit diagram of square wave generator. [2]

***

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

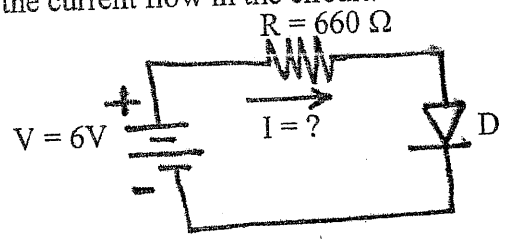
2070 Ashad

Exam.	NEW BACK (2070 Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

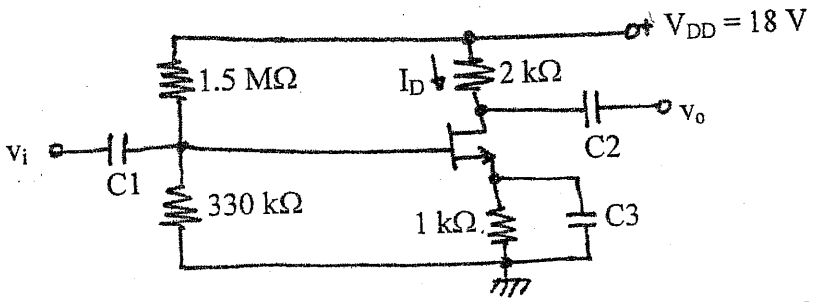
Subject: - Electronic Device and Circuits *(EX501)*

- ✓ 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 operating point in diode? Draw the dc load line with the help of diode circuit and its characteristics curve. [1+3]
2. In the given circuit, the diode used has its n = 1.74 and it conducts 1mA at forward bias voltage of 0.7V. Find the current flow in the circuit. [6]



3. Design a voltage divider type dc biased common emitter amplifier to obtain β independent biasing. Use appropriate guidelines to support your design. Given parameters are: V_{CC} = 12 VDC, I_C = 2 mA and β = 150. Also determine its voltage gain. [6+2]
4. Draw the small signal model for Common collector Aplifier and find its input resistance and voltage gain. [2+3+3]
5. Find I_D and V_{DC} for the given circuit. Given data are: V_P = -5.5V, I_{DSS} = 12 mA and assume all capacitors are ideal and check whether transistor is operating in pinch off region or not? [2+2+2+2]



6. Explain why self DC biasing MOSFET circuit is better than fixed DC biasing MOSFET circuit. [4]
7. Derive an expression to find the transconductance for JEET. [4]
8. Draw the circuit of class A series fed amplifier and its corresponding characteristic graph. And, find its general efficiency. [1+2+3]
9. Draw the circuit diagram of transformer coupled class B push-pull amplifier. And show that the maximum efficiency is 25 π %. [2+4+2]
10. Define Barkhausen criteria for sinusoidal. Draw the circuit diagram of RC phase shift oscillator and derive its frequency of oscillation. [2+2+6]
11. Draw the circuit diagram of variable series voltage regulator with transistor as error amplifier. And find its voltage stability factor and explain how change in output voltage can be improved. [2+4+2]
12. Design a voltage regulator circuit using LM317 to obtain 16 VDC with the input 24 VDC. [4]
13. Draw the square wave generator circuit using operational amplifier. [2]

***

27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electromagnetics *(EX503)*

- ✓ 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**.*
- ✓ ***Necessary formulas are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Given a point P(-3, 4, 5), express the vector that extends from P to Q(2, 0, -1) in (a) Rectangular coordinates (b) Cylindrical coordinates (c) Spherical coordinates. [5]
2. Verify the divergence theorem (evaluate both sides of the divergence theorem) for the function $\vec{A} = r^2 \vec{a}_r + r\sin\theta\cos\phi\vec{a}_\theta$, over the surface of quarter of a hemisphere defined by: $0 < r < 3$, $0 < \phi < \pi/2$, $0 < \theta < \pi/2$. [6]
3. Given the potential field $V = 100xz/(x^2+4)$ volts in free space: [7]
   a) Find $\vec{D}$ at the surface, z=0
   b) Show that the z=0 surface is an equipotential surface
   c) Assume that the z=0 surface is a conductor and find the total charge on that portion of the conductor defined by $0 < x < 2$, $-3 < y < 0$
4. State the uniqueness theorem and prove this theorem using Poisson's equation. [2+6]
5. State Amperes circuital law with relevant examples. The magnetic field intensity is given in a certain region of space as $\vec{H} = \frac{x+2y}{z^2}\vec{a}_y + \frac{2}{z}\vec{a}_z$ A/m. Find the total current passing through the surface $z = 4$, $1 < x < 2$, $3 < y < 5$, in the a_z direction. [3+5]
6. Define scalar and vector magnetic potential. Derive the expression for the magnetic field intensity at a point due to an infinite filament carrying a dc current I, placed on the z-axis, using the concept of vector magnetic potential. [3+5]
7. Define displacement current. Assume that dry soil has conductivity equal to 10^{-4} S/m, $\varepsilon = 3\varepsilon_0$ and $\mu = \mu_0$. Determine the frequency at which the ratio of the magnitudes of the conduction current density and displacement current density is unity. [2+5]
8. Derive the expression for electric field for a uniform plane wave propagating in a free space. [7]
9. State Poynting's theorem. An EM wave travels in free space with the electric field component $\vec{E} = (10\vec{a}_y + 5\vec{a}_z)\cos(\omega t + 2y - 4z)$ [V/m]. Find (a) ω and λ (b) the magnetic field component (c) the time average power in the wave. [1+2+2+2]
10. A lossless transmission line with $Z_0 = 50\Omega$ is 30m long and operates at 2 MHz. The line is terminated with a load $Z_L = (60+j40)\ \Omega$. If velocity (v) = 3×10^8m/s on the line. Find (a) the reflection coefficient, (b) the standing wave ratio and the input impedance. [2+2+3]
11. Explain the modes supported by Rectangular waveguide. Define cutoff frequency and dominant mode for rectangular waveguide. [2+2+2]
12. Write short notes on: [2+2]
    a) Antenna types and properties
    b) Quarter wave transformer

***

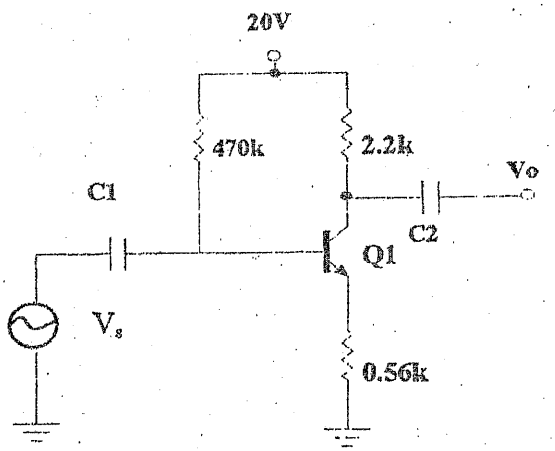
26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

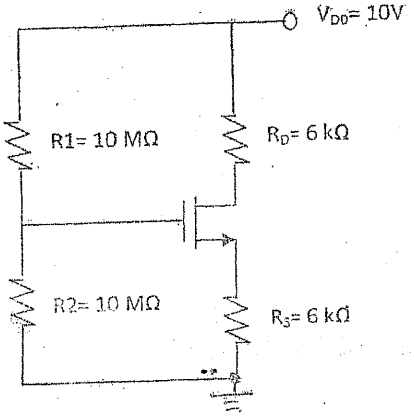
Subject: - Electronic Devices and Circuit *(Ex 501)*

- ✓ 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. Explain the large signal models of PN junction diode. [4]
2. A diode conducts 1mA at 20°C. If it is operated at 100°C, what will be its current? Given data are: η=1.8 and negative temperature coefficient value = –1.8mv/°C. [4]
3. For the figure shown below with β = 120 find the a) input impedance (b) Output impedance (c) voltage gain (d) current gain. Use small signal model. [2+2+2+2]



4. Draw ac equivalent circuit of common collector amplifier. Find its input and output resistances. [2+3+3]
5. Describe the physical structural of N-channel JEET and explain its working principle and characteristics clearly marking the various regions of operation. [2+6]
6. Derive the expression to obtain the transconductance of E-MOSFET. [4]
7. Find the drain current (I_D) and drain to source voltage (V_{DS}) for the following circuit. Given parameters are: V_t = 1V and k = 0.5mA/V^2. [4]



8. Draw the circuit diagram of class B push pull amplifier with output transformer and explain how push pull action is achieved. Determine the general efficiency of class B push pull amplifier. [1+3+4]

9. Draw class A tuned amplifier circuit and derive the expression for 3dB bandwidth of the amplifier. [2+6]

10. Describe the operation of IC 555 as square wave oscillator and find its frequency of oscillation. [6+2]

11. Estimate voltage stability factor (S_V) for standard series dc voltage regulator using BJT. Also, explain the operation of overload protection circuit that could be used in series voltage regulator circuit. [5+3]

12. A class B audio amplifier is providing 20V peak sine wave signal to 8Ω speaker with power supply of 25V (=V_{CC}). At what efficiency is it operating? [4]

13. Define and explain the reverse breakdown effect in diodes. [4]

***

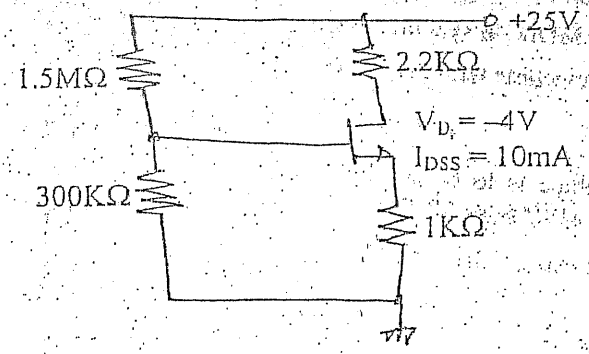
25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Baishakh

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electronic Devices and Circuits

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

1. Draw graphs of IV characteristics of ordinary PN junction diode and zener diode. Draw ac equivalent model for PN junction diode and derive its ac resistance. [7]
2. Define and explain reverse break down effect. [3]
3. Design β-independent type dc biased common collector amplifier, and find its current gain and input resistance. Given parameters are: $V_{CC} = 20V$, $I_C = 2mA$, $\beta = 100$ and use firm biasing method. [8]
4. Derive an expression to find output resistance for emitter unbypassed common emitter amplifier circuit. [5]
5. Draw Ebers Moll model and ac equivalent T- model for BJT. [4]
6. Describe the principle of operation of EMOSFET with the help of IV characteristic curves and algebraic expressions. Also show its ac equivalent circuit model. [7]
7. Find I_D and V_{DS} for the given circuit. [5]



8. Derive an expression to find the tranconductance for JFET. [2]
9. Draw standard series dc voltage regulator circuit and find its voltage stability factor (S_v). [6]
10. Draw a voltage regulator circuit using IC LM317. [3]
11. Draw a circuit diagram for Bandgap reference voltage source. [3]
12. Define cross over distortion in class B amplifier. Draw quasi-complementary symmetry class AB amplifier. And explain how crossover distortion is eliminated in class AB amplifier. [7]
13. What is the maximum efficiency of class B amplifier? State the condition when it occurs. [4]
14. Why heat sink is necessary in power transistor? Explain with the help of thermal Ohm's law or thermal resistance method. [4]
15. State Barkhausen criteria and explain the principle of oscillation. [4]
16. Draw Wien Bridge Oscillator circuit and write the expression for frequency of Oscillation. [6]
17. Draw crystal oscillator circuit.

***

21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electronic Devices

- ✓ 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. a) Show proper IV characteristics of zener diode with the help of experimental circuit diagram. [2]

   b) Design dc voltage regulator for 6V output. [4+2+2]

   Given data: $V_z = 6V$ at $I_z = 20mA$, $I_{zk} = 2mA$, $P_{z\,max} = 500mW$ and $r_z = 20\Omega$. The nominal input voltage is 12V DC ± 20%. And, find its voltage regulation factor and maximum current it can deliver to the load.

   c) Prove that $V_{D2} - V_{D1} = 2.3\,\eta V_T \log \frac{I_{D2}}{I_{D1}}$. [2]

2. a) Design common base amplifier using β-independent dc biasing method. [5]

   Given data: $V_{CC} = 24V$ DC, $I_C = 1mA$ and $\beta = 200$

   b) Find its voltage gain approximately by using its ac equivalent circuit. [4]

   c) Describe the method of finding output resistance of common emitter amplifier with the help of its equivalent circuit diagram. [4]

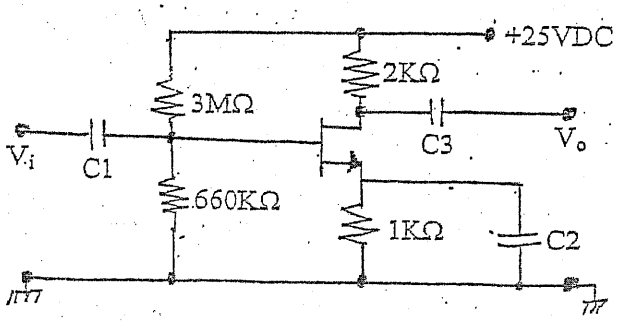
3. a) Draw simple T-model and BJT. [1]

   b) Draw h-model and low frequency π-model of BJT both operating in common emitter amplifier configuration and compare their parameters. [1+1+4]

4. Describe the principle of operation of EMOSFET with the help of $I_D V_{DS}$ characteristics. Find expressions when it operates in ohmic region and also in pinch off region of operations. [5+2+2]

5. a) Find the value of I_D and V_{DS} in the given circuit diagram. [4]

   Given data: $I_{DSS} = 10mA$, $V_{GS(OFF)} = -4V$. Capacitors are ideal.



   b) Draw its ac equivalent circuit. [2]