DHANALAKSHMI SRINIVASAN COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

Academic Year: 2018 – 2019 Odd Semester

Subject: EC8353 - ELECTRON DEVICES AND CIRCUITS

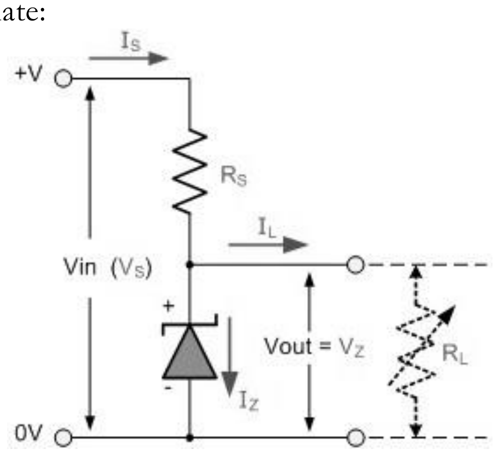
SEM/YEAR: III Semester/ II Year EEE

QUESTION BANK

SUBJECT : EC8353 - ELECTRON DEVICES AND CIRCUITS
SEM/ YEAR : III / II YEAR EEE

UNIT I - PN JUNCTION DEVICES			
PN junction diode –structure, operation and V-I characteristics, diffusion and transient capacitance -Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes- Zener diode characteristics-Zener Reverse characteristics – Zener as regulator			
PART - A			
Q. No	**Questions**	**BT Level**	**Domain**
1.	Draw the symbol of the following devices PN Diode, Zener Diode, LED, and UJT.	BTL 1	Remembering
2.	What is a rectifier? Name its types.	BTL 1	Remembering
3.	Predict the diffusion capacitance fora silicon diode with a 10 mA forward current, if the charge carrier transit time is 60ns.	BTL 3	Applying
4.	How does the transition region width and contact potential across a PN junction vary with the applied bias voltage?	BTL 1	Remembering
5.	With suitable expression model transition capacitance and Diffusion capacitance?	BTL 3	Applying
6.	Construct the LASER Diode and give its applications.	BTL 3	Applying
7.	A full-wave rectifieruses two diodes, the internal resistance of each diode may be assumed constant at 20 Ω. The transformer R.M.S. secondary voltage from Centre tap to each end of secondary is 50 V and load resistance is 980 Ω. Evaluate : (i) The mean load current (ii) The R.M.S. value of load current	BTL 4	Analyzing
8.	List out the factors on which barrier potential depends.	BTL 1	Remembering
9.	Discuss the effect of temperature on reverse saturation current of a diode.	BTL6	Creating
10.	Outline transformer utilization factor and state its value for HWR and FWR.	BTL 2	Understanding
11.	Compare and contrast between P-N junction diode and Zener diode.	BTL 2	Understanding
12.	Assess the terms Knee voltage (V_C) and Breakdown voltage (V_B).	BTL 5	Evaluating
13.	Calculate the total power supplied to a 3½ digit LED display when it indicates 1999. A 5V supply is used and each LED has a 10 mA Current.	BTL 4	Analyzing
14.	State the mathematical equation which relates voltage applied across the PN junction diode and current flowing through it and list the PN diode parameters.	BTL 1	Remembering
15.	Summarize the limiting values of PN Junction Diode.	BTL 2	Understanding
16.	A silicon diode has a saturation current of 7.5μA at room temperature. Estimate the saturation current at 400 ° K	BTL 6	Creating

18.	Define Diode-resistance.	BTL 1	Remembering
19.	A Ge diode has a saturation current of 10μA at 300° K. Determine the saturation current at 400°K.	BTL 5	Evaluating
20.	Show the VI characteristics of Zener diode and Mention its applications.	BTL 2	Understanding
PART - B			
1.	With neat sketch compose the construction, operation and its characteristics of PN junction diode. Also list its advantages, disadvantages and its applications. (13)	BTL3	Applying
2.	Briefly enumerate the following (i) Laser diodes (7) (ii) Zener diode as a voltage regulator (6)	BTL1	Remembering
3.	(i) Summarize the effect of temperature on PN junction diode and draw its switching characteristics (8) (ii) The reverse saturation of a silicon PN junction diode is 10μA. Infer the diode current for the forward bias voltage of 0.6V at 25° (5)	BTL 2	Understanding
4.	(i) Review the expression for current through the PN junction diode. (7) (ii) Explain the V-I characteristics of Zener diode and Analyze between Avalanche and Zener Break downs? (6)	BTL 2	Understanding
5.	(i) Generalize the action of a full wave rectifier using diodes and give waveforms of input and output voltages. (6) (ii) A FW diode rectifier has V_1=100sinωt, R_L=900Ω and R_f=100Ω. Come up with the peak and dc load current, DC load voltage, the peak instantaneous diode current, the PIV on the diode, AC input power, output power, Rectification efficiency of the FW rectifier. (7)	BTL 6	Creating
6.	(i) Determine the minimum and maximum values of the load resistance of the Zener shunt regulator to meet the following specifications V_S=24V, V_Z=10V, i_{ZMIN}=3mA, I_{ZMAX}=50mA and R_L=250Ω. (7) (ii) Show the circuit diagram of a half wave rectifier for producing a positive output voltage. Explain the circuit operation and sketch the waveforms. (6)	BTL 1	Remembering
7.	(i) In what aspect is a LED different from a PN junction diode? Analyze the applications of LED. (7) (ii) Illustrate the working of center tapped full wave rectifier with and without filter with neat diagrams. (6)	BTL 4	Analyzing
8.	Draw the circuit diagram and compose the working of full wave bridge rectifier with output filter and derive the expression of average output current, voltage, efficiency, ripple factor, PIV and TUF. (13)	BTL5	Evaluating
9.	Make use of a diagram recollect the working of Zener diode and its forward and reverse characteristics. Also distinguish between Avalanche and Zener break downs (13)	BTL2	Understanding
10.	(i) Describe the construction, operation and characteristics of LED. (7) (ii) Examine how does Zener diode shunt voltage regulator operates. (6)	BTL 1	Remembering
11.	Derive ripple factor, PIV, efficiency and TUF of Bridge rectifier with circuit diagram and input/output waveforms (13)	BTL4	Analyzing
12.	Examine the operation of half wave rectifierand derive FF, PF, RF, TUF, PIV and efficiency. (13)	BTL4	Analyzing

13.	(i) Explain the VI characteristics of Zener diode. (6) (ii) Derive the expression of the space charge or Transition capacitance of PN diode under reverse bias with neat diagram (7)	BTL 1	Remembering
14.	A bridge rectifier is supplied with 230V, 50Hz supply with stepdown ratio of 3:1 to a resistive load of 10kΩ. If the diode forward resistance is 75Ω while the transformer secondary resistance is 10Ω. Calculate the maximum and average values of current, dc output voltage and rms voltage, efficiency, ripple factor, peak factor, form factor, PIV and TUF. (13)	BTL 3	Applying
PART – C			
1.	A germanium diode has a contact potential of 0.2volts while the concentration of accepted impurity atoms is $3x10^{20}/m^3$. Calculate for a reverse bias of 0.1 volt, the width of the depletion region. If the reverse bias is increased to 10volt, calculate the new width of the depletion region. Assuming cross sectional area of the junction as $1mm^2$, Solve the transition capacitance values for both the cases. Assume ε_r=16 for germanium. (15)	BTL 6	Creating
2.	An AC supply of 220V, 50 Hz is applied to a HWR through a transformer of turn ratio 10:1. Determine (15) a) Maximum RMS load Voltage b) Maximum RMS load current c) Power delivered to the load d) AC power input e) Efficiency and ripple factor f) PIV, ripple frequency, ripple voltage and ripple current.	BTL 5	Evaluating
3.	A 230 V, 50 Hz voltage is applied to the primary of a 5:1 stepdown center-tapped transformer used in a FWR having a load of 900Ω. If the diode resistance and the secondary coil resistance together has a resistance of 100Ω evaluate, (15) a) DC voltage across the load b) DC current flowing through the load c) DC power delivered to the load d) PIV across each diode e) Ripple voltage and its frequency	BTL 5	Evaluating
4.	(i) A 5.0V stabilized power supply is required to be produced from a 12V DC power supply input source. The maximum power rating P_Z of the Zener diode is 2W. Using the Zener regulator circuit below calculate: (8)  a) The maximum current flowing through the Zener diode. b) The minimum value of the series resistor, R_S	BTL6	Creating

	c) The load current I_L if a load resistor of 1kΩ is connected across the Zener diode. d) The Zener current I_Z at full load. (ii) Consider the characteristic curve for a Zener diode shown below (7) a) What is the current when the diode has a forward bias of 0.8 V? b) What is the breakdown voltage of this diode? c) What is the power dissipated in this diode when it carries a reverse current of 100 mA? d) Describe how this diode could be used to provide a steady voltage of 25 V across a load from an unregulated DC supply.		

UNIT II - TRANSISTORS AND THYRISTORS

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT -Structure and characteristics.

PART - A

Q. No	Questions	BT Level	Domain
1.	State Base width modulation in transistor?	BTL 1	Remembering
2.	Review "Thermal runaway" in transistors and mention how it can be avoided.	BTL 2	Understanding
3.	A BJT has a base current of 200μA. Determine the collector current and β.	BTL 5	Evaluating
4.	Draw the transfer and drain characteristic curves of JFET	BTL 1	Remembering
5.	Inspect why it is necessary to stabilize the operating point of transistor.	BTL 4	Analyzing
6.	In an N-channel JFET I_{DSS}=20 mA and V_P= -6V. Estimate the drain current when V_{GS}= -3V.	BTL 5	Evaluating
7.	Differentiate between JFET and MOSFET.	BTL 4	Analyzing
8.	Make use of the values of transistor has β=150, find the collector and base current if I_E= 10mA	BTL 1	Remembering
9.	Predict the dc current gain (β_{DC} & α_{DC}) and the emitter current I_E for a transistor where I_B = 50 μA and I_C = 3.65 mA.	BTL 6	Creating
10.	Express how an FET is used as a voltage variable resistor.	BTL 2	Understanding
11.	Interpret an intrinsic standoff ratio of UJT and draw its equivalent circuits.	BTL 2	Understanding
12.	Discuss about thyristor and mention their types.	BTL 6	Creating

13.	List out the different methods to turn on the thyristor?	BTL 1	Remembering
14.	An SCR in a circuit is subjected to a 50 A surge that lasts for 12 ms. Discover whether or not this surge will destroy the device. Given that circuit fusing rating is 90 $A^2 s$.	BTL 3	Applying
15.	Define the terms Firing angle and Conduction angle of an SCR.	BTL 1	Remembering
16.	A 220Ω resistor is connected in series with the gate of an SCR The gate current required to fire the SCR is 7mA. What is the input voltage (Vin) required to fire the SCR?	BTL 1	Remembering
17.	Compare the characteristics of BJT, MOSFET and IGBT.	BTL 4	Analyzing
18.	Interpret the terms latching current & holding current.	BTL 3	Applying
19.	Show how an SCR can be triggered ON by the application of a pulse to the gate terminal.	BTL 2	Understanding
20.	Write the difference between TRIAC and DIAC.	BTL 3	Applying

	c) If VCC is decreased until the SCR opens, what is the value of VCC? (8)		

PART - B	
1.	Explain BJT Common Base configuration, with a neat diagra the common base input and output characteristics with necess
2.	Elaborate the construction and operation of NPN transistor v sketch. Also comment on the characteristics of NPN transistor
3.	(i) Summarize the input and output characteristics of an Em Follower. (7) (ii) Compare and contrast between CE, CB and CC configurat
4.	With neat diagram explain the working of Enhancement MOS Depletion MOSFET withits necessary characteristics curve.
5.	(i) Illustrate Early effect with relevant expressions and diagran (ii) Demonstrate the input and output characteristics CE configuration. (7)
6.	(i) Outline the hybrid model of BJT and derive the importan parameters. (7) (ii) Model and explain the typical shape of drain characteristi JFET for V_{GS}=0 with indication of four region clearly. (6)
7.	(i) Enumerate the selection of Q point for transistor bias cir discuss the limitations on the output voltage swing. (ii) Show the cross section diagram of an N type enhancemer MOSFET. Briefly explain its operation. (6)
8.	Describe the construction and working of UJT with its equiva and VI characteristics.
9.	Draw and explain the construction, operation and V-I charact SCR.
10.	(i) Analyze the structure and operation of Insulated Gate Bip Transistor. (7) (ii) Distinguishbetween MOSFET and IGBT.
11.	(i) Differentiate between SCR and UJT. (ii) The SCR of below figure has gate trigger voltage V_T = 0.7 trigger current I_T = 7 mA and holding current I_H = 6 mA. (a) The output voltage when the SCR is off? b) The input voltage that triggers the SCR?

12.	(i) The operation of UJT as a relaxation oscillator and derive its frequency of oscillation. (7) (ii) Mention the advantages & applications of UJT. (6)	BTL 5	Evaluating
13.	(i) Outline the basic construction, operation and V-I characteristics of DIAC. (7) (ii) Show the four layer construction, two transistor equivalent circuit of an SCR and explainthe device operation in detail. (6)	BTL 1	Remembering

14.	(i) What is an IGBT? Draw the structure and equivalent model of an IGBT explain in detail with switching characteristics. (7) (ii) Write in detail about the operation of TRIAC. (6)	BTL1	Remembering

PART - C			
1.	Design a voltage divider bias circuit fortransistor to establishthe quiscent point at V_{CE}=12V, I_C=1.5mA, stability factor S≤3, β = 50, V_{BE}=0.7V, V_{CC}=22.5V and R_C=5.6kΩ. (15)	BTL 6	Creating
2.	Draw d.c load line and a.c load line for the following transistor configuration. Obtainthe operating point. (15)	BTL 6	Creating
3.	(i) For an n-channel silicon FET with a=3x10^{-4} cm and N_d=10^{15} electrons/cm^{-3}. Evaluate (a) pinch off voltage (b) the channel half width for V_{GS}= 0.5V_p. (5) (ii) In biasing with feedback resistor method, a silicon transistor with feedback resistor is used. The operating point is 7V, 1mA and V_{CC}=12V. Assume β=100. Determine the value of RB, Stability factor and the new operation point if β=50 and all other circuit values for the same. (10)	BTL 5	Evaluating
4.	The reverse leakage current of the transistor when connected in CB configuration is 0.2 mA and it is 18 μA when the same transistor is connected in CE configuration. Determine αdc & βdc of the transistor. Assume IB =30mA. (15)	**BTL 5**	**Evaluating**

UNIT III - AMPLIFIERS			
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response – MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response-High frequency analysis.			
PART - A			
Q. No	**Questions**	**BT Level**	**Domain**
1.	Sketch the hybrid model of BJT in CE and CB configuration.	BTL 1	Remembering
2.	Write about amplifiers and mention its applications.	BTL 1	Remembering
3.	Model the small signal equivalent circuit of a CS JFET.	BTL 3	Applying
4.	In a common base connection, current amplification factor is 0.9. If the emitter current is 1mA, find the value of base current.	BTL5	Evaluating
5.	Analyze the expressions for the h-parameters.	BTL 4	Analyzing
6.	For an amplifier, midband gain =100 and lower cut-off frequency is 1 kHz. Estimate the gain of an amplifier at frequency of 20Hz.	BTL 6	Creating
7.	Discuss the significance of coupling and bypass capacitor on bandwidth of amplifiers	BTL 2	Understanding
8.	Express the term bandwidth and gain bandwidth product.	BTL 1	Remembering
9.	Draw the DC equivalent circuit of an amplifier.	BTL 1	Remembering
10.	A common emitter amplifier has an input resistance 2.5kΩ and voltage gain of 200.If the input signal voltage is 5mV. Find the base current of the amplifier.	BTL5	Evaluating
11.	Point out why CE configuration is preferred over CB configuration.	BTL 4	Analyzing
12.	Outline the procedure to draw the AC equivalent of a network	BTL 2	Understanding
13.	Identify the reason for fall in gain at low and high frequencies in an amplifier.	BTL 3	Applying
14.	State Miller's theorem.	BTL 1	Remembering
15.	When transistoracts as a switch, inwhich region of output characteristics it is operated?	BTL 4	Analyzing
16.	Examine the features of Source follower.	BTL 3	Applying
17.	When V_{GS} of the FET changes from -3.1V to 3V the drain current changes from 1 mA to 1.3mA Calculate the value of transconductance.	BTL 6	Creating
18.	Define transconductance of MOSFET.	BTL 1	Remembering
19.	Show the frequency response curve of an amplifier and what does 3 dB frequency denotes.	BTL 2	Understanding
20.	Compare the performance of CE,CB,CC amplifier configurations	BTL 2	Understanding
PART - B			

1.	Illustrate the h-parameter model of a BJT-CE amplifier and derive the equations for voltage gain, current gain, input impedance and output impedance. (13)	BTL 2	Understanding
2.	Describe about small signal MOSFET amplifiers (NMOS) and obtainthe expression for the transconductance. (13)	**BTL1**	**Remembering**
3.	Demonstrate the mid band analysis of single stage CE, CB and CC amplifiers. (13)	**BTL3**	**Applying**
4.	(i) Derive the expression for the voltage gain of CS amplifier. (5) (ii)Calculate the input capacitance limited cut-off frequency for the following circuit when operated as a CS circuit with RS by-passed. Assume that there is no additional stray capacitance at the input terminals and that the FET has the following parameters. . $C_{rss} = 1pF, C_{iss} = 5pF, Y_{fs} = 2500\mu S\ an\ _{os} = 75\mu S.$ (8)	**BTL3**	**Applying**
5.	(i) Discuss the factors involved in Ic, Rc and R_E for a single stage common emitter BJT amplifiercircuit, usingvoltage divider bias. (5) (ii) A CC amplifier shown in below figure has V_{CC}=15 V, R_B=75kΩ and R_E=910Ω The β of the silicon transistor is 100 and the load resistor is 600Ω. Estimate R_{in} and A_v. (8)	BTL6	Creating
6.	Draw the circuit diagram of a common drain MOSFET amplifier. Derive the expression for its voltage gain, input resistance and output resistance. (13)	BTL 5	Evaluating
7.	Analyze the operation of CB amplifier and derive the expression for h parameters of the same. Also derive the expression for gain, input impedance and output impedance ofCB amplifier. (13)	BTL4	Analyzing
8.	(i) Explain about CS amplifier and derive the expression for gain, input impedance and output impedance and also draw its small Signal equivalent circuit. (ii) Express the equation for calculating the value of the source bypass capacitor for a single stage common source amplifier using voltage divider bias using high frequency equivalent circuit. (6) (7)	BTL 2	Understanding

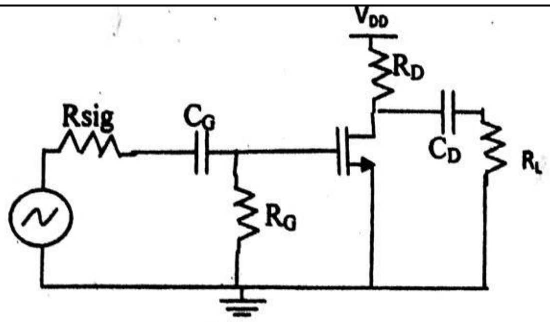
	(ii) Express the equation for calculating the value of the source bypass capacitor for a single stage common source amplifier using voltage divider bias using high frequency equivalent circuit. (6)		

5.	(iii) Discuss the factors involved in Ic, Rc and R_E for a single stage common emitter BJT amplifiercircuit, usingvoltage divider bias. (5) (iv) A CC amplifier shown in below figure has V_{CC}=15 V, R_B=75kΩ and R_E=910Ω The β of the silicon transistor is 100 and the load resistor is 600Ω. Estimate R_{in} and A_v. (8)	BTL6	Creating
6.	Draw the circuit diagram of a common drain MOSFET amplifier. Derive the expression for its voltage gain, input resistance and output resistance. (13)	BTL 5	Evaluating
7.	Analyze the operation of CB amplifier and derive the expression for h parameters of the same. Also derive the expression for gain, input impedance and output impedance ofCB amplifier. (13)	BTL4	Analyzing

8.	(i) Explain about CS amplifier and derive the expression for gain, input impedance and output impedance and also draw its small Signal equivalent circuit. (7)	BTL 2	Understanding

	(ii) Express the equation for calculating the value of the source bypass capacitor for a single stage common source amplifier using voltage divider bias using high frequency equivalent circuit. (6)		
9.	The hybrid parameters of a transistor used as an amplifier in the CE configuration are hie = 800Ω, hfe = 46, hoe = 80 × 10^{-6} and hre = 5.4× 10^{-4}. If R_L = 5kΩ and R_s =500Ω. Find Ai, Ri , Av, Ro. (13)	BTL1	Remembering
10.	(i) Inspect the high frequency response of FET and derive the expression for lower cut off frequency and upper cut off frequency. (9) (ii) The data sheet of an enhancement MOSFET gives I_D(min) = 500mA at V_{GS} = 10V and $V_{GS(th)}$ = 1V. Find the drain current for VGB = 5V. (4)	BTL4	Analyzing
11.	(i) Demonstrate the low frequency analysis of BJT and also determine the effect of Cs, Cc & Cc on the low frequency response of BJT. (7) (ii) Summarize the high frequency analysis of common source amplifier. (6)	BTL 2	Understanding
12.	Explain about CC amplifier and derive the expression for h parameters of the same. Also derive the expression for gain, input impedance and output impedance of CC amplifier. (13)	BTL4	Analyzing
13.	Determine the mid-band gain and bandwidth of a CE amplifier shown in the figure. Assume lower cutoff frequency is 100Hz . Let h_{fe} =β =100, C_{be} = 4pF , C_{bc}=0.2pF and V_A = ∞. (13)	BTL1	Remembering
14.	(i) Show the low frequency h-equivalent model of a transistor amplifier operating in CE mode and write why this circuit is not valid for high frequencies. (8) (ii) Define the transconductance of BJT in the CE mode. How it is related to h parameters. (5)	BTL1	Remembering

PART – C			
1.	(i) Determine the mid-band gain, upper cutoff frequency of a common source amplifier fed with the signal having internal resistance Rsig = 100kΩ. The amplifier has Rg = 4.7MΩ, R_D = R_L = 15kΩ, g_m = 1mA /V, r_o =150kΩ, C_{gs} =1pF and C_{gd} = 0.4pF. (8)	BTL5	Evaluating

	 (ii) For CS amplifier, the operating point is defined by V_{GSQ}=-2.5V, V_P=-6V & I_{dQ}=2.5mA with I_{DSS}=8mA. Also R_G=1MΩ, R_S=1KΩ,R_D=2.2kΩ and V_{DD}=15V. Calculateg_m, r_d, Z_i, Z_O & A_V. (7)		
2.	For a CB amplifier driven by voltage source of internal resistance Rs=1200Ω. The load impedance is resistor R_L=1000Ω. The h parameters are h_{ib}=22Ω,h_{cb}=3x10^{-4}, h_{fb}= -0.98 and h_{ob}=0.5A/V. Estimatethe current gain A_i, Input impedance R_i, voltage gain A_v, overall current gain A_{is}, overall voltage gain A_vs and output impedance Z_o. (15)	BTL6	Creating
3.	The hybrid parameters for CE amplifier are h_{ie} = 1000 Ω , h_{fe} = 150 , h_{re} = 1.2 x10^{-4} , h_{oe} = 2.5 x 10^{-6} mho. The transistor has a load resistance of 10kΩincollectorand supplied from signal source of 1k Ω. Deduce the values of input impedance, output impedance, current gain and voltage gain. (15)	BTL6	Creating
4.	The following figure shows a common emitter amplifier. Determine the input resistance, ac load resistance, voltage gain and output voltage. (15)	BTL5	Evaluating

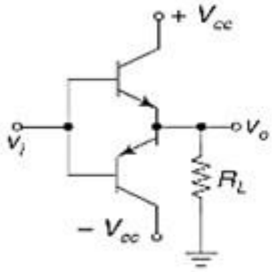
UNIT IV - MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER

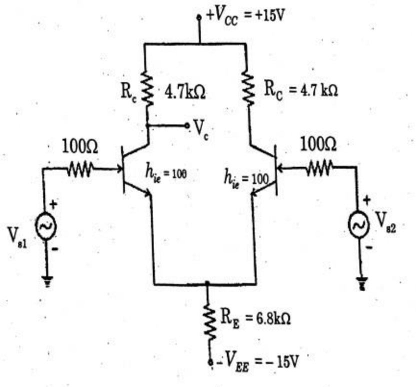
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers – Types (Qualitative analysis).

PART – A

Q.No	Questions	BT Level	Domain
1.	What are cascaded amplifiers? Mention the need for cascading the amplifiers.	BTL 1	Remembering
2.	A tuned circuit has a resonant frequency of 1600kHz and a bandwidth of 10kHz.Calculate the value of the Q factor .	BTL 3	Applying

3.	Analyze how the differential amplifier can be used as an emitter coupled phase inverter	BTL 4	Analyzing
4.	Discuss the need for neutralization.	BTL 6	Creating
5.	A multistage amplifier employs five stages of which each has a power gain of 30. Determine the total gain of the amplifier in dB.	BTL 3	Applying
6.	Examine the nature of CMRR and mention various methods of improving CMRR.	BTL 4	Analyzing
7.	List the applications of differential amplifier.	BTL 1	Remembering
8.	CMRR of an amplifier is 100dB, calculate common mode gain , if the differential gain is 100.	BTL 1	Remembering
9.	Construct a Differential amplifier and write the ideal value of CMRR.	BTL 3	Applying
10.	Distinguish common mode and difference mode.	BTL 4	Analyzing
11.	Summarize the advantages and performance of class- C amplifier	BTL 2	Understanding
12.	Examine the impact of cross over distortion in an amplifier.	BTL 4	Analyzing
13.	Illustrate the ideal tuned circuit and write the expression for it's resonant frequency.	BTL 2	Understanding
14.	Enumerate the need of Complementary symmetry amplifiers.	BTL1	Remembering
15.	Assess the bootstrapping technique.	BTL5	Evaluating
16.	Outline the Conversion efficiency of power amplifier.	BTL 2	Understanding
17.	In an RC coupled power amplifier, the a.c. voltage across load $R_{L=}$ 100 Ω has a peak- to-peak value of 18V. Estimate the maximum possible a.c. load power.	BTL 6	Creating
18.	Quote the advantages of Push pull amplifier	BTL1	Remembering
19.	Enumerate the advantages of single tuned amplifiers.	BTL1	Remembering
20.	Outline the need for constant current source for difference amplifier.	BTL 2	Understanding
	PART – B		
1.	Illustrate the circuit of emitter coupled BJT differential amplifier, and derive expressions for differential gain, common mode gain and CMRR. (13)	BTL 2	Understanding
2.	(i) What is Neutralization? Explainany one method in brief. (8) (ii) Tabulate the difference betweenvoltage and power amplifier. (5)	BTL 1	Remembering
3.	With neat sketch explain two stage cascaded amplifier and derive its overall Av, AI, RI and Ro. (13)	BTL 3	Applying
4.	Sketch he differential amplifier and its ac equivalent circuit. Derive for Ad and Ac. (13)	BTL 1	Remembering
5.	With neat diagram, explain the BJT differential amplifier with active load and derive Ad, Ac and CMRR. How CMRR can be improved? (13)	BTL 1	Remembering

6.	(i) Explainthe different types of distortion in power amplifiers. (8) (ii) In an ideal Class B amplifier with complimentary symmetry as shown in the figure, V_{cc} = 15V and R_L =10 Ω. Determine the (a) maximum signal output power, the corresponding collector dissipation and conversion efficiency and (b) maximum dissipation on each transistor and the corresponding conversion efficiency. (5)  	BTL 2	Understanding
7.	Develop the equation for differential mode gain and common mode gain of a differential amplifier using FET. Derive the expression for differential mode gain and common mode gain. (13)	BTL 3	Applying
8.	The differential amplifier has the following values R_C = 50kΩ, R_E= 100 kΩ and R_s = 10 kΩ. The transistor parameters are h_{ie}, = 50 kΩ, h_{fe} = V_o = 2 x10^3, r_o= 400kΩ.Determine A_d, A_c and CMRR in dB.(13)	BTL 5	Evaluating
9.	(i) Describe about complementary symmetry class B amplifier and obtain its efficiency. (7) (ii) Outline the operation of class AB amplifier to avoid cross over distortion. (6)	BTL 1	Remembering
10.	The dual input balanced output differential amplifier having R_s=100Ω, R_C =4.7kΩ, R_E =6.8kΩ, h_{fe}=100,Vcc=+15V, V_{EE}=-15V. Find operating point values, differential &common mode gain, CMRR and output if V_{s1}=70mV(p-p)at 1 kHz and V_{s2}=40mV(p-p) . (13)	BTL 6	Creating
11.	If Class C tuned amplifier has R_L = 6kΩ and required tank circuit Q = 80. Estimate the values of L & C of the tank circuit. Assume V_{CC}=20V, resonant frequency = 5MHz and worst case power dissipation = 20mW. (13)	BTL 4	Analyzing
12.	(i) Draw a circuit diagram to show how the current in the output transistors of a power amplifier can be limited to a desired maximum level. Examine the circuit operation. (8) (ii) Compare MOSFET to power BJT. (5)	BTL 4	Analyzing
13.	(i) Classify the power amplifiers and calculate the efficiency of each types. (8) (ii) Discuss the advantages and disadvantages of any three classes of power amplifiers. (5)	BTL 2	Understanding
14.	Explain about Class A transformer coupled and Class C power amplifier and derive the expression for efficiency of the same. (13)	BTL 4	Analyzing
PART – C			
1.	Evaluate the operating point, differential gain, common mode gain, CMRR and output voltage if V_{S1}=70 mV peak to peak at 1kHz and V_{S2} =40mV peak to peak at 1kHz of dual input balanced output differential amplifierh_{ie}=2.8kΩ. (15)	BTL 6	Creating

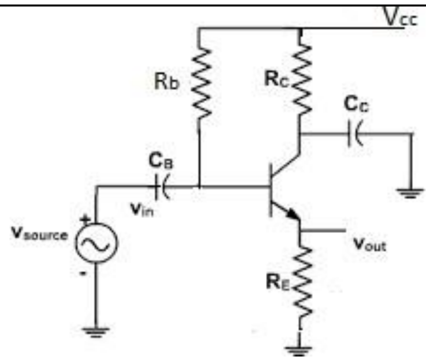
			
2.	For the circuit shown below, calculate (i) Output power if the output voltage is 50 V_{PP} (ii) Maximum ac output power (iii) DC input power if current drain is 0.5mA (iv) Efficiency if the current drain is 0.4mA and the output voltage is $30V_{PP}$. (v) Bandwidth of amplifier if Q=125 (vi) Worst case transistorpower dissipation. (15)	BTL 5	Evaluating
3.	A power transistor working in class-A operation is supplied from a 12-volt battery. If the maximum collector current change is 100 mA, Determine the power transferred to a 5Ω loudspeaker if it is : (15) (i) directly connected in thecollector (ii) transformer-coupled for maximum power transference Find the turn ratio of the transformer in the second case.	BTL 6	Creating
4.	Categorize the Neutralization methods used in an amplifier and assess its nature of operation with an appropriate circuit diagram.Mention its advantages and disadvantages. (15)	BTL 5	Evaluating

UNIT V - FEEDBACK AMPLIFIERS AND OSCILLATORS

Advantages of negative feedback – voltage / current, series, Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

PART – A

Q. No	Questions	BT Level	Competence
1.	Examine the advantages of negative feedback.	BTL 4	Analyzing
2.	Summarize the disadvantages of negative feedback in amplifiers and how it can be overcome?	BTL 2	Understanding
3.	Discover how the amplifiers are classified according to the negative feedback?	BTL 3	Applying
4.	Show the equation for closed loop gain of series-shunt amplifier.	BTL 1	Remembering
5.	What type of feedback present in the circuit given below ?	BTL 1	Remembering

			
6.	The open loop voltage gain of a transistor amplifier is liable to change by 30%. A feedback amplifier circuit with overall gain of 50 is to be designed. It is desired that overall gain should not vary by more than 1%. Determine the open loop gain and feedback factor.	BTL 5	Evaluating
7.	Predict the most commonly used feedback arrangement in cascaded amplifier and why?	BTL 2	Understanding
8.	Which type of feedback circuit increases gain of an amplifier?	BTL 1	Remembering
9.	Articulate your comments on the stability of feedback amplifiers.	BTL 3	Applying
10.	Illustrate the factors that affects the stability of amplifiers.	BTL 4	Analyzing
11.	Formulate the two Barkhausen conditions required for sinusoidal oscillation to be sustained.	BTL 6	Creating
12.	Compare oscillator and amplifier.	BTL 5	Evaluating
13.	Classify the types of feedback amplifiers and infer which type of feedback is used in oscillators.	BTL 2	Understanding
14.	Write the expression for frequency of oscillation of RC phase shift oscillator.	BTL 1	Remembering
15.	Choose the merits and demerits of RC phase shift oscillators.	BTL 1	Remembering
16.	Express the frequency of oscillations for a Wein bridge oscillator.	BTL 2	Understanding
17.	Select the advantages of a Colpitts Oscillator compared to a phase shift oscillator.	BTL 3	Applying
18.	Draw the equivalent circuit of Crystal oscillator.	BTL 1	Remembering
19.	Outline the Piezo-electric effect.	BTL 4	Analyzing
20.	Compose the advantages of Crystal Oscillator.	BTL 6	Creating
	PART - B		
1.	(i) What is feedback? Show the difference betweenpositive and negative feedback. Why negative feedback is very commonly used in many control and instrumentation circuits? (5) (ii) Write the effects of negative feedback on gain, bandwidth, noise and distortion of an amplifier circuit. How does it providegain stability? (8)	BTL 1	Remembering
2.	With a neat block diagram explain the operation of following feedback amplifiers. (i) Voltage series feedback amplifier (7) (ii) Current shunt feedback amplifier (6)	BTL 2	Understanding
3.	Demonstrate the following feedback configurations of amplifiers and obtain the feedback factor and closed loop gain. (i) Shunt – Shunt feedback (6) (ii) Series – Series feedback	BTL 3	Applying

	(7)		

4.	(i) The open loop voltage gain of an amplifier is 50 and its input impedance is 1kΩ. Estimate the input impedance, when a negative feedback of 10% is applied to the amplifier? (5) (ii) Evaluate the voltage gain, input and output resistance of a voltage series feedback amplifier having $A_v = 300$, $R_i = 1.5k\Omega$, $R = 50k\Omega$ $and\ \beta = \frac{1}{15}$. (8)	BTL 5	Evaluating
5.	Identify the nature of feedback for the given circuit diagram. Let $R_{c1} = 3K\Omega$, $R_{c2} = 500\Omega$, $R_E = 50\Omega$, $R_s = R_f = 1.2k\Omega$, $h_{fe} = 50$, $h_{ie} = 1.1k\Omega$, $h_{re} = h_{ce} = 0$. Find overall voltage gain A_v, overall current gain A_{if}, input impedance R_{if} and output impedance R_{of}. (13)	BTL 1	Remembering
6.	(i) Point out the advantages of negative current feedback on the performance of amplifiers. (4) (ii) When a negative voltage feedback is applied to an amplifier of gain 100, the overall gain falls to 50 analyze the fraction of the output voltage feedback. If this fraction is maintained, examine the value of the amplifier gain required if the overall stage gain is tobe 75. (4) (iii) Classify the various types of topology in feedback amplifiers. (5)	BTL 4	Analyzing
7.	(i) Illustrate about the stability analysis using the frequency response of the loop gain of the feedback amplifier system. (6) (ii) Choose the compensation methods to achieve stability in amplifiers. (7)	BTL 3	Applying
8.	Explain the RC phase shift oscillator with a neat diagram by using BJT and also derive the condition for oscillation. (13)	BTL 2	Understanding
9.	With neat diagram examine the Wein bridge oscillator and derive an expression for frequency of oscillation. (13)	BTL 4	Analyzing
10.	Write the expressions for frequency of oscillation for Hartley oscillator with a neat circuit diagram by using BJT and briefly explain it. (13)	BTL 1	Remembering
11.	Describe the operation of Colpitts oscillator with neat circuit diagram. Also derive the expressions for the frequency of oscillation and the conditin for maintenance of oscillation. (13)	BTL 2	Understanding
12.	(i) In a Colpitts oscillator, $C_1 = C_2 = C\ and\ L = 100 \times 10^{-6}H$. The frequency of oscillation is $500kHz$. Design the value of C. (6) (ii) In Colpitts oscillator, the desired frequency is $500kHz$. Estimate the value of L by assuming $C = 1000pF$. (4) (iii) A 1 mH inductor is available. Choose the capacitor values in a Colpitts oscillator so that f = 1 MHz and feedback fraction is 0.25 (3)	BTL 6	Creating

13.	Examine the operation of the Crystal oscillators. (13)	BTL 1	Remembering
14.	(i) A crystal has the following parameters L = 0.5 H, Cs = 0.06 pF, Cp = 1pF and R = 5kΩ. Inspect the series and parallel resonant frequencies and Q-factor of the crystal. (8) (ii) Distinguish between Crystal oscillators & LC oscillators. (5)	BTL 4	Analyzing
PART – C			
1.	When a portion of the output signal is fed to input, as you are aware, feedback is generated. Developthe difference betweennegative feedback and positive feedback and elaborate on their individual advantages. How different parameters of an amplifier will be affected by these two types of feedback? (15)	BTL 6	Creating
2.	Sketchthe circuit diagram of a two-stage capacitorcoupled BJT amplifier that uses series voltage negative feedback. Briefly explain how the feedback operates. (15)	BTL 5	Evaluating
3.	Design an oscillator to operate at a frequency of 10kHz which gives an extremely pure sine wave output, good frequency stability and highly stabilized amplitude. Discuss the operation of this oscillator as an audio signal generators. (15)	BTL 6	Creating
4.	(i) Determine the RC Phase shift oscillator to generate 5 kHz sine wave with 20V peak to peak amplitude and draw the circuit for designed by assuming $h_{fe} = 150$. (10) (ii) A Wein bridge oscillator has a frequency of 6000 Hz. If $R_1 = R_2 = 100k\Omega$. Select the value of $C_1\ nd\ C_2$. (5)	BTL 5	Evaluating