SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF

ELECTRONICS AND INSTRUMENTATION ENGINEERING

QUESTION BANK

III SEMESTER

1907301 ELECTRON DEVICES AND CIRCUITS

Regulation – 2019

Academic Year 2022 –2023

Prepared by

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SUBJECT : 1907301 - ELECTRON DEVICES AND CIRCUITS

SEM / YEAR: III / II

UNIT I - PN JUNCTION DEVICES

SYLLABUS

PN junction diode –structure, operation and V-I characteristics, diffusion and transition 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	Competence
1.	What is transition capacitance and diffusion capacitance?	BTL-1	Remember
2.	What is rectifier and list its types?	BTL-1	Remember
3.	Summarize the two types of junction capacitances.	BTL-2	Understand
4.	Assess the term hole current in PN diode?	BTL-5	Evaluate
5.	Define depletion region.	BTL-1	Remember
6.	Examine the current components in a PN diode.	BTL-3	Apply
7.	Differentiate between avalanche breakdown & Zener breakdown.	BTL-2	Understand
8.	A 6.2V Zener diode has a resistance of 20 Ohms. Calculate the terminal voltage when the current is 20 mA?	BTL-3	Apply
9.	List out the factors on which barrier potential depends.	BTL-4	Analyze
10.	Give the drawback of Zener Voltage Regulator.	BTL-2	Understand
11.	Discuss about the working principle of Laser diodes.	BTL-2	Understand
12.	Label the structure of PN Junction diode.	BTL-1	Remember
13.	Show the expressions of RMS current & ripple factor for bridge rectifier.	BTL-3	Apply
14.	Mention some of the applications of laser diode.	BTL-4	Analyze
15.	Choose few applications of zener diode.	BTL-6	Create
16.	A silicon diode has a saturation current 7.5μA at room temperature 300k.Find the saturation current at 400k.	BTL-5	Evaluate
17.	List out the applications of LEDs.	BTL-1	Remember
18.	Compare N-type impurity and P-type impurity in a semiconductor.	BTL-4	Analyze
19.	Define the term transition capacitance C_T of a PN diode.	BTL-1	Remember
20.	Formulate on form factor and peak factor of rectifier circuits.	BTL-6	Create

21.	Discuss the effect of temperature on semiconductor.	**BTL-2**	Understand
22.	Draw the VI characteristics of PN junction diode.	**BTL-3**	Apply
23.	List out the importance of peak inverse voltage?	**BTL-1**	Remember
24.	What are the advantages of bridge rectifier over centre tapped counterpart?	**BTL-1**	Remember
	PART-B		
1.	**(i)** Draw the circuit diagram and explain the working principle of full wave rectifier**. (6)** **(ii)**Derive the expression for ripple factor, voltage, PIV, transformer Utilization Factor**. (7)**	**BTL-3**	Apply
2.	Derive the expression for diffusion capacitance of PN junction diode. **(13)**	**BTL-6**	Create
3.	Derive the expression of the Space charge or transition capacitance of PN diode under reverse bias with a neat diagram. **(13)**	**BTL-2**	Understand
4.	Explain the working principle of a Half wave rectifier and its various parameters. **(13)**	**BTL-1**	Remember
5.	With neat sketch explain the construction, operation, and its characteristics of PN junction diode. **(13)**	**BTL-3**	Apply
6.	Explain the construction and working of full wave rectifier with neat diagram**. (13)**	**BTL-5**	Evaluate
7.	Describe the action of a full wave bridge rectifier using diodes and give waveforms of input and output voltages. **(13)**	**BTL-2**	Understand
8.	Briefly describe about the following **(i)** Laser Diode **(6)** **(ii)** LED. **(7)**	**BTL-1**	Remember
9.	Explain the working, advantages, and applications of Light Emitting Diodes. **(13)**	**BTL-2**	Understand
10.	**(i)** Examine the construction and working principle of Zener diode with a neat sketch. **(7)** **(ii)** Explain how Zener diode can be acts as a voltage regulator. **(6)**	**BTL4**	Analyze
11.	Make use of a diagram, explain the working of Zener diode and its Characteristics. **(13)**	**BTL2**	Understand
12.	Derive the expression for a ripple factor in a half wave bridge rectifier with resistive load. **(13)**	**BTL-4**	Analyze
13.	Derive the expression for a ripple factor in a full wave bridge rectifier with resistive load. **(13)**	**BTL-4**	Analyze
14.	Explain the construction and working of different types of Display Devices with neat diagram**. (13)**	**BTL-1**	Remember
15.	Write short notes on (i) Break down voltage(7) (ii) Knee voltage(6)	**BTL-1**	Remember
16.	Explain the term (i) static and dynamic resistance(6) (ii) junction resistance (4) (iii) reverse resistance of the diode(3)	**BTL-2**	Understand

17.	Explain the following term in a PN junction diode. (i)Maximum forward current(5) (ii) Peak inverse voltage(4) (iii) Maximum power rating.(4)	**BTL-2**	Understand
	PART-C		
1.	An AC supply of 230V, 50 Hz is applied to a HWR through a step-down ratio of 3:1 to a resistive load of 10KΩ.The diode forward resistance is 75Ω while transformer secondary resistance is 10Ω.Calcuate maximum average, RMS values of current, d.c output voltage, efficiency of rectification and ripple factor**. (15)**	**BTL 5**	Evaluate
2.	A 230 V,60 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 determine, **(i)** DC voltage across the load **(ii)** DC current flowing through the load **(iii)** DC power delivered to the load **(iv)** PIV across each diode **(v)** Ripple voltage and its frequency. **(15)**	**BTL 5**	Evaluate
3.	Design and draw a Zener regulator circuit to meet the following specification. (i)Load voltage=8V, input voltage=30V. (ii)Load current=0-50 mA, I_{zmin}=5 mA. (iii)P_z=1 Watt. **(15)**	**BTL 6**	Create
4.	There is an application which needs the output voltage to be regulated. Choose an appropriate diode/device that would ensure this operation with appropriate circuit, describe how it regulates voltage. Consider a specific example design the circuit with appropriate values of components involved. State the important constraints that need to be considered. **(15)**	**BTL 6**	Create
5.	Compare full wave rectifier and full wave rectifier.(15)	**BTL-1**	Remember
	UNIT II - TRANSISTORS AND THYRISTORS		
	SYLLABUS BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics.		
	PART – A		
Q.No	**Questions**	**BT Level**	**Competence**
1.	Define early effect.	**BTL-1**	Remember
2.	Determine the base current of CE transistor Circuit if I_c =80 mA and	**BTL-4**	Analyze
3.	How does a transistor act as a switch?	**BTL-1**	Remember
4.	A transistor has a typical β of 100.If the collector current is 40 mA, calculate is the value of emitter current?	**BTL-4**	Analyze
5.	What is meant by biasing?	**BTL-1**	Remember
6.	Compare BJT and FET.	**BTL-4**	Analyze
7.	Measure the value of ideal voltage gain for a certain JFET has a g_m of 4 mS. with an external drain resistance of 1.5 K ohms.	**BTL-5**	Evaluate

8.	Evaluate the value of Transconductance. When VGS of a FET changes from -3.1V to -3V, the drain current changes from 1 mA to 1.3 mA.	**BTL-5**	Evaluate
9.	Write about the intrinsic standoff ratio of a UJT.	**BTL-1**	Remember
10.	Demonstrate the concept of operating point with suitable graph.	**BTL-6**	Create
11.	Draw the structure of UJT.	**BTL-3**	Apply
12.	Design a basic circuit for an operation of enhancement type MOSFET.	**BTL-6**	Create
13.	Differentiate the between the SCR and TRIAC.	**BTL-2**	Understand
14.	Show how an SCR can be triggered on by the application of a pulse to gate terminal.	**BTL 2**	Understand
15.	Give the VI characteristics of TRIAC.	**BTL-2**	Understand
16.	Draw the symbol of IGBT.	**BTL-3**	Apply
17.	Draw the two-transistor equivalent circuit of SCR.	**BTL-3**	Apply
18.	What is break over voltage of SCR?	**BTL-1**	Remember
19.	List few applications for thyristors.	**BTL-1**	Remember
20.	Distinguish the latching current & holding current.	**BTL-2**	Understand
21.	Name the three possible connections in transistors.	**BTL-4**	Analyze
22.	Draw the symbol of PNP and NPN transistor.	**BTL-3**	Apply
23.	Explain voltage gain	**BTL-2**	Understand
24.	What are the advantages of transistor?	**BTL-1**	Remember
	PART – B		
1.	Show the construction and operation of MOSFET with neat diagram. **(13)**	**BTL-3**	Apply
2.	Explain the construction and working of **(i)**N-channel JFET. **(6)** **(ii)**P-channel JFET. **(7)**	**BTL-2**	Understand
3.	Explain the construction and working of **(i)** Depletion mode MOSFET. **(6)** **(ii)** Enhancement mode MOSFET. **(7)**	**BTL-4**	Analyze
4.	(i)Describe the operation of UJT as a relaxation oscillator. **(7)** (ii) derive its frequency of oscillation. **(6)**	**BTL-2**	Understand
5.	Explain the construction and operation of CB configuration with neat sketch. **(13)**	**BTL-5**	Evaluate
6.	Explain the construction and operation. **(i)** NPN transistor. **(7)** **(ii)** PNP transistor. **(6)**	**BTL-4**	Analyze
7.	Explain the following and determine the stability factor for each case. **(13)** **(i)**Fixed bias **(ii)**Collector to base bias **(iii)**Voltage divider bias.	**BTL-3**	Apply
8.	Explain the basic construction and equivalent circuit of a UJT and briefly explain the device operation. **(13)**	**BTL-1**	Remember
9.	Show the four-layer construction of SCR and two transistor equivalent circuit and explain the device operation. **(13)**	**BTL-1**	Remember
10.	Describe the working principle of SCR and its VI characteristics. **(13)**	**BTL-1**	Remember
11.	Explain the construction and operation of CE configuration with neat sketch. **(13)**	**BTL-6**	Create
12.	Explain the construction and working of IGBT with neat diagram. **(13)**	**BTL-4**	Analyze

13.	Describe the construction and working principle of DIAC with neat sketches. **(13)**	**BTL-1**	Remember
14.	Take part in discussion about the working of thyristor and two transistor analogy of a thyristor in detail. **(13)**	**BTL-2**	Understand
15.	Describe the construction and working principle of TRIAC with neat sketches. **(13)**	**BTL-1**	Remember
16.	What is faithful amplication?Explain the condition to be fulfilled amplification to be achieved in transistor amplifier.	**BTL-3**	Apply
17.	Mention the steps that are taken to design the transistor biasing and stabilisig circuits.	**BTL-4**	Analyze
	PART – C		
1.	**(5)** The intrinsic stand –off ration for an UJT is determined to be 0.6. If the inter base resistance is 10KΩ. What are the values of resistors R_{B1} and R_{B2}? **(7)** **(ii)** A UJT has 10 V between the bases. If the intrinsic stand -off ratio is 0.65, find the value of stand-off voltage. What will be the peak point voltage if the voltage drop in the PN junction is 0.7 V. **(8)**	**BTL-6**	Create
2.	A transistor operating in CB configuration has I_c=2.98 Ma.I_E=3 Ma. And I_{CO}=.01 Ma. What current will flow in the collector circuit of this transistor when connected in CE configuration with a base current of 30 x 10^{-6} A. **(15)**	**BTL-5**	Evaluate
3.	Asses the operation of various types of configurations of BJT with neat diagram. **(15)**	**BTL-5**	Evaluate
4.	Design a voltage divider bias circuit for transistor to establish the quiescent point at V_{CE} =12V, I_C =1.5Ma, Stability factor S≤ 3, β =50, VBE=0.7V, VCC = 22.5V and R_C=5.6 KΩ. **(15)**	**BTL-6**	Create
5.	Explain the working and principle of operation of UJT and mention its applications.	**BTL-5**	Evaluate
	UNIT III – AMPLIFIERS		
	SYLLABUS 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**	**Competence**
1.	Show the hybrid model of BJT in CE configuration.	**BTL 1**	Remember
2.	What are amplifiers? Write it's uses.	**BTL 1**	Remember
3.	Model the small signal equivalent circuit of a CS JFET.	**BTL 3**	Apply
4.	Justify the need of coupling capacitors in amplifier design?	**BTL 5**	Evaluate
5.	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**	Create
6.	How can a DC equivalent circuit of an amplifier be obtained?	**BTL 1**	Remember
7.	State the phase relationships between input /output currents and phase relationships between input/output voltages of various transistor configurations.	**BTL 1**	Remember

8.	Point out why Common Emitter configuration is preferred over Common Collector configuration.	**BTL 4**	Analyze
9.	Mention the procedure to draw the a.c. equivalent of a network.	**BTL 3**	Apply
10.	Identify the reason for fall in gain at low and high frequencies.	**BTL 3**	Apply
11.	When vgs of the FET changes from 3.1V to 3V the drain voltage changes from 1mA to 1.3 mA. Analyze the value of g_m.	**BTL 4**	Analyze
12.	Define transconductance of MOSFET.	**BTL 1**	Remember
13.	Compare the performance of CE and CC configuration.	**BTL 2**	Understand
14.	In a common base configuration, current amplification factor is 0.9. If the emitter current is 1mA, estimate the value of base current.	**BTL 2**	Understand
15.	Assess the frequency response curve of an amplifier and what is 3 dB frequency.	**BTL 5**	Evaluate
16.	Point out the output characteristics of CE Amplifier.	**BTL 4**	Analyze
17.	Define crossover distortion. How it can be minimized?	**BTL 1**	Remember
18.	State Miller's Theorem.	**BTL 2**	Understand
19.	Design the hybrid small signal model of CB configuration.	**BTL 6**	Create
20.	A common emitter amplifier has an input resistance 2.5KΩ and voltage gain of 200.If the input signal voltage is 5 mV, find the base current of the amplifier.	**BTL 2**	Understand
21.	Define phase reversal.	**BTL 1**	Remember
22.	What is meant by DC load line?	**BTL 2**	Understand
23.	What is meant by Ac load line?	**BTL 2**	Understand
24.	List the classification of amplifiers.	**BTL 3**	Apply
	PART – B		
1.	Tabulate the comparison and contrast all the parameters of CC, CB, and CE amplifiers. **(13)**	**BTL 1**	Remember
2.	**(i)**Analyze the h-parameter equivalent circuit for a typical common emitter amplifier and derive the expression for A_i, R_i, A_v *and* R_o. **(10)** **(ii)**Point out the characteristics and uses of common emitter amplifier. **(3)**	**BTL 4**	Analyze
3.	Derive the h-parameter model for CE configuration. **(13)**	**BTL 1**	Remember
4.	Analyse about the Common Drain Amplifier with neat diagram. **(13)**	**BTL 6**	Create
5.	Describe and draw the A.C equivalent circuit of a CB amplifier using h-parameter model and derive the equations for Z_i, Z_o, A_v *and* A_i. **(13)**	**BTL 3**	Apply
6.	**(i)**Analyze the h-parameter equivalent circuit for a typical CC amplifier and derive the expression for A_i, R_i, A_v *and* R_o. **(10)** **(ii)** Point out the characteristics and uses of CC amplifier. **(3)**	**BTL 2**	Understand
7.	Derive the h-parameter model for CC configuration. **(13)**	**BTL 1**	Remember
8.	Deduce the derivation for the Z_i, A_v, A_i *and* Z_o for CE amplifier using simplified hybrid model. **(13)**	**BTL 5**	Evaluate
9.	Derive the h-parameter model for CB configuration. (**13)**	**BTL 1**	Remember
10.	**(i)**Describe the h-parameter representation of a transistor. **(10)** **(ii)**Mentation the advantages of h-parameter model. **(3)**	**BTL 2**	Understand
11.	Explain the concept of Common Source Amplifier with necessary circuit diagram. **(13)**	**BTL 4**	Analyze
12.	Explain the midband analysis of CB, CC and CE amplifiers. **(13)**	**BTL 4**	Analyze

13.	Summarize the expression for gain and frequency response of amplifier using BJT with suitable diagram. **(13)**	**BTL 2**	Understand
14.	Draw the circuit diagram of a common drain MOSFET amplifier. Derive the expression for its voltage gain, input and output resistance. **(13)**	**BTL 3**	Apply
15.	Compare the parameter model of CB.CC and CE configuration.	**BTL 1**	Remember
16.	Explain about the two port devices and hybrid model.	**BTL 4**	Analyze
17.	Describe about the small signal analysis of emitter follower.	**BTL 5**	Evaluate
	PART – C		
1.	A common emitter amplifier has an input resistance =2.5 KΩ and a voltage gain of 200.If the input signal voltage is 5 mv, (a)the base current(b)the collector current(c)the power gain, and (d)db power gain. Take β =50**. (15)**	**BTL 6**	Create
2.	The hybrid parameters for CE amplifier are hie=1000Ω, hoe=25 x 10^{-6} ohms, hfe=150 and hre=1.2 x $10^{-4.}$ The transistor has a load resistance of 10KΩ in collector and supplied from signal source of resistance 5KΩ.Calculate the values of input impedance, output impedance, current gain and voltage gain. **(15)**	**BTL 5**	Evaluate
3.	Evaluate the A_i, A_v, Ri_i, R_o, A_{is}, A_{vs} of a single stage Common Emitter amplifier with Rs = 500Ω, RL= 2000Ω, hfe=50, hie=1KΩ, hoe=25μ A/V and hre=2x$10^{-4.}$**(15)**	**BTL 5**	Evaluate
4.	A common emitter amplifier has an input resistance =3 KΩ and a voltage gain of 300.If the input signal voltage is 4 mv, (a)the base current(b)the collector current(c)the power gain, and (d)db power gain. Take β =50**. (15)**	**BTL 6**	Create
5.	A given transistor with Ic =10mA (Collector current), VCE =10 V (Collector-Emitter voltage) and at room temperature has the following set of low frequency parameters:hie=500Ω, hoe=10−5A/V, hfe=100 and hre=10−4. Design the values of all hybrid -π parameters of a low frequency model and draw the equivalent low frequency hybrid -π model. (15)	**BTL 5**	Evaluate
	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**	**Competence**
1.	Define a common mode rejection ratio for a differential amplifier. What is the value of CMRR for ideal cases?	**BTL 1**	Remember
2.	CMRR of an amplifier is 100 dB, estimate common mode gain, if the differential gain is 1000.	**BTL 2**	Understand
3.	A multistage amplifier employs 5 stages each of which has a power gain of 30.What is the total gain of the amplifier in db?	**BTL 1**	Remember
4.	Model the ideal tuned circuit and write the expression for its resonant frequency.	**BTL 3**	Apply
5.	Discuss the need for cascading the amplifiers.	**BTL 1**	Remember
6.	Why neutralization is important? And give its types.	**BTL 1**	Remember
7.	Define differential mode signals of a differential amplifier.	**BTL 1**	Remember

8.	Construct a Differential amplifier and what is the ideal value of CMRR?	**BTL 3**	Apply
9.	Outline the need for constant current source for difference amplifier.	**BTL 2**	Understand
10.	Compare the performance of various power amplifier types.	**BTL 4**	Analyze
11.	Classify amplifiers according to the input.	**BTL 3**	Apply
12.	Summarize the advantages and performance of class-c amplifier.	**BTL 5**	Evaluate
13.	Define conversion efficiency of power amplifier.	**BTL 1**	Remember
14.	Distinguish common mode and difference mode.	**BTL 2**	Understand
15.	Take part in discussing the term cross over distortion.	**BTL 4**	Analyze
16.	Compare gain and frequency.	**BTL 4**	Analyze
17.	Assess the frequency response of double tuned amplifier for coupling coefficient=1,k>1,k<1.	**BTL 5**	Evaluate
18.	Discuss the need for complementary symmetry amplifier.	**BTL 6**	Create
19.	Write the advantages of push pull amplifier.	**BTL 2**	Understand
20.	A single tuned amplifier is tuned to receive the single at 650 kHz with bandwidth of 10 kHz. Design the loaded quality factor of the tuned amplifier.	**BTL 6**	Create
21.	What is meant by differential amplifier?	**BTL 3**	Apply
22.	List out the importance of CMRR?	**BTL 2**	Understand
23.	Define output offset voltage.	**BTL 1**	Remember
24.	Define input offset current.	**BTL 1**	Remember
	PART – B		
1.	Design the circuit diagram of a single tuned amplifier and explain its working in detail. **(13)**	**BTL 6**	Create
2.	Draw a differential amplifier and its equivalent circuit. Derive for Ad and Ac. **(13)**	**BTL 3**	Apply
3.	**(i)**Explain the working of class-C power amplifier with diagrams. **(7)** **(ii)**Derive the expression for efficiency of the class-C power amplifier. **(6)**	**BTL 1**	Remember
4.	Describe the complementary symmetry (class B) push pull amplifier in detail. **(13)**	**BTL 1**	Remember
5.	What is neutralization? Explain any two methods in brief. **(13)**	**BTL 4**	Analyze
6.	With neat diagram, explain the emitter coupled BJT differential amplifier, and express differential gain, common mode gain and CMRR. **(13)**	**BTL 4**	Analyze
7.	With neat sketch explain two stage cascaded amplifier and analyze its overall A_v, A_t, R_t *and* R_o. **(13)**	**BTL 4**	Analyze
8.	**(i)**Explain the working of transformer coupled class-A power amplifier with diagrams. **(7)** **(ii)**Derive the expression for efficiency of the class-A power amplifier. **(6)**	**BTL 1**	Remember
9.	**(i)**Classify the power amplifiers and calculate the efficiency for various types of power amplifiers. **(10)** **(ii)** List the characteristics of power amplifiers. **(3)**	**BTL 2**	Understand
10.	Describe the working principle of single tuned amplifier with neat circuit diagram. **(13)**	**BTL 1**	Remember
11.	Describe the common mode and differential mode analysis of differential amplifier using FET and determine its CMRR**. (13)**	**BTL 2**	Understand
12.	Examine the common mode and differential mode analysis of differential amplifier and determine its CMRR. **(13)**	**BTL 3**	Apply

13.	With neat diagram, describe the working of a differential amplifier using FET. **(13)**	**BTL 2**	Understand
14.	Discuss the operation of class AB amplifier to avoid cross over distortion with neat diagram. **(13)**	**BTL 5**	Evaluate
15.	Discuss about the AC analysis of differential amplifier.	**BTL 3**	Apply
16.	Describe about the different coupling schemes in amplifiers.	**BTL 1**	Remember
17.	Explain in detailed about the RC coupled amplifiers.	**BTL 4**	Analyze
	PART – C		
1.	**(i)**Derive the equation for the efficiency of a Class B power amplifier with neat diagram. **(8)** **(ii)**Derive the conversion efficiency and the relation between maximum power output and maximum power dissipation for class B push pull power amplifier. **(7)**	**BTL 6**	Create
2.	In the differential amplifier assume $\beta 1=\beta 2=15$. Evaluate the DC value of emitter current, collector current, collector voltage, AC voltage gain and AC output voltage. The values are $V_{CC} = 12V$, $R_{C1}=R_{C2}=36k\Omega$, $V\text{in}1=2mV$, $V_{EE} = -12V and\ R_E = 33k\Omega$. **(15)**	**BTL 5**	Evaluate
3.	Evaluate the **(i)** operating point **(ii)** differential gain **(iii)** common mode gain **(iv)** CMRR and **(v)** output voltage. If V_{s1} =70 mV peak to peak at 1 kHz and V_{s2} = 40 mV peak to peak at 1 kHz of dual input balanced output differential amplifier, hie =2.8 $k\Omega$. The values are V_{CC} = +15V, $R_{C1}=R_{C2}=4.7k\Omega$, R_E = 6.8 $k\Omega$, Rs=100Ω, β =100, VEE=15V, VBE=0.7V, V_{CC}=15V and h_{fe}=100. **(15)**	**BTL 6**	Create
4.	Explain the basic operation of different types of power amplifiers with neat diagram. (**15)**	**BTL 5**	Evaluate
5.	Design an differential amplifier using FET and explain in amplifier.	**BTL 6**	Create
	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.	The overall gain of a multistage amplifier is 140.When negative voltage feedback is applied the gain is reduced to 17.5. Find the fraction of the output that is feedback to the input.	**BTL 1**	Remember
2.	Assess the two Barkhausen conditions required for sinusoidal oscillation to be sustained.	**BTL 5**	Evaluate
3.	A tuned circuit has a resonant frequency of 1600 kHz and a bandwidth of 10 kHz. What is the value of its Q factor?	**BTL 1**	Remember
4.	List the disadvantages of negative feedback in amplifiers and how it can be overcome?	**BTL 1**	Remember

5.	Show the expression for the frequency of oscillations of a in RC phase shift oscillator.	**BTL 3**	Apply
6.	An amplifier has a current gain of 240 and input impedance of 15KΩ without feedback. If negative current feedback (current attenuation = 0.015) is applied, what will be the input impedance of the amplifier?	**BTL 5**	Evaluate
7.	What is the advantage of a Colpitts oscillator compared to a phase shift oscillator?	**BTL 4**	Analyze
8.	Which is the most used feedback arrangement in cascaded amplifier and why?	**BTL 1**	Remember
9.	Which type of feedback circuit increases gain of an amplifier?	**BTL 1**	Remember
10.	Outline the advantages of crystal oscillator.	**BTL 2**	Understand
11.	Discuss about Nyquist's stability criteria for feedback amplifiers.	**BTL 2**	Understand
12.	Develop the oscillator model which uses both positive and negative feedback? Why?	**BTL 6**	Create
13.	Determine the operating frequency of transistor Hartley oscillator if L1=50μH, L2=1mH, and mutual inductance between the coils M=10 μH and C=10pF.	**BTL 3**	Apply
14.	Point out the five characteristics of an amplifier which are modified by negative feedback.	**BTL 4**	Analyze
15.	List out the advantages of RC phase shift oscillator.	**BTL 1**	Remember
16.	Analyze the effects on bandwidth and output impedance due to various types of feedback.	**BTL 4**	Analyze
17.	Illustrate the expression for frequency of oscillation of a Wein bridge oscillator.	**BTL 3**	Apply
18.	Distinguish between negative and positive feedback.	**BTL 2**	Understand
19.	Discuss the limitations of LC and RC oscillators.	**BTL 2**	Understand
20.	A Wein bridge oscillator is used for operating at f_0 =10KHz. If the value of R is 100Ω. Design the value of capacitor.	**BTL 6**	Create
21.	What is the effect of lower cut off frequency with negative feedback?	**BTL 1**	Remember
22.	What are the essential for oscillator?	**BTL 4**	Analyze
23.	What are the draw backs of phase shift oscillators?	**BTL 2**	Understand
24.	Mention any two high frequency LC oscillator.	**BTL 3**	Apply
	PART – B		
1.	With neat block diagram, explain the operation of following feedback amplifiers. **(i)** Voltage series feedback amplifier. **(7)** **(ii)** Current shunt feedback amplifier. **(6)**	**BTL 4**	Analyze
2.	**(i)**Explain with neat circuit diagram, the working of Hartley oscillator using transistor. **(7)** **(ii)**Derive an expression for frequency of oscillation. **(6)**	**BTL 1**	Remember
3.	**(i)**With neat diagram explain Wien – Bridge oscillator. **(6)** **(ii)**Derive an expression for frequency of oscillation. **(7)**	**BTL 1**	Remember
4.	Illustrate the CE amplifier with voltage shunt- feedback with neat diagram. **(13)**	**BTL 3**	Apply
5.	Illustrate the circuit of CE amplifier with current series feedback and obtain the expression for feedback ratio, voltage gain, input resistances and output resistances. **(13)**	**BTL 3**	Apply

6.	**(i)**Explain the operation of Colpitts Oscillator with neat diagram. **(6)** **(ii)**Derive the expressions for the frequency of oscillation and the condition for maintenance of oscillation. **(7)**	**BTL 2**	Understand
7.	Explain the construction and working of crystal oscillator with neat diagram. (**13)**	**BTL 2**	Understand
8.	Explain the construction and working of Hartley oscillator with neat diagram. (**13)**	**BTL 5**	Evaluate
9.	Design a Colpitts oscillator with C1 = 100pf and C2 = 7500pf. The inductance is variable. Determine the range of inductance values, if the frequency of oscillation is to vary between 950 KHz and 2050 KHz. **(13)**	**BTL 6**	Create
10.	Sketch a circuit diagram of a two-stage capacitor coupled BJT amplifier that uses series voltage negative feedback. **(13)**	**BTL 4**	Analyze
11.	Explain the working of a phase shift oscillator. Discuss its advantages and disadvantages. **(13)**	**BTL 1**	Remember
12.	Explain the operation of current series feedback amplifier and derive its expression for **(i)**Input resistance **(4)** **(ii)**Output resistance **(4)** **(iii)**Voltage gain **(3)** **(iv)**Feedback ratio **(2)**	**BTL 4**	Analyze
13.	Describe about the basic concept of feedback and explain about the positive feedback. **(13)**	**BTL 1**	Remember
14.	Discuss the advantages of negative current feedback on the performance of amplifiers. **(13)**	**BTL 2**	Understand
15.	State and briefly explain barkhausen criteria for oscillation.(13)	**BTL 5**	Evaluate
16.	Explain the operation of tank circuit.(13)	**BTL 4**	Analyze
17.	Differentiate oscillator with the amplifiers.(13)	**BTL 2**	Understand
	PART – C		
1.	Determine the frequency of oscillations hen a RC phase shift oscillator has R=12 $k\Omega$, C=0.01 µF and R_C=3.3 $k\Omega$. Also find the minimum current gain needed for this purpose. **(15)**	**BTL 6**	Create
2.	**(i)**When negative voltage feedback is applied to an amplifier of gain 100, the overall gain falls to 50. Find the fraction of the output voltage feedback. If this fraction is maintained, find the value of the amplifier gain required if the overall stage gain is to be 75**. (5)** **(ii)** Calculate the amplifier gain, f_{1f}, f_{2f} and D_f when negative feedback ratio of 0.01. An amplifier has voltage gain of 400, f_1 =50Hz, f_2 = 200kHz and distortion of 10% without feedback. **(10)**	**BTL 6**	Create
3.	**(i)**In a Colpitts oscillator, C1=C2=C and L=100 x 10^{-6}H. The frequency of oscillation is 500 KHz. Determine the value of C. **(8)** **(ii)**In Colpitts oscillator, the desired frequency frequency is 500 KHZ. Find the value of L. Assume C=1000 pF.**(7)**	**BTL 5**	Evaluate

4.	An amplifier has a mid-frequency gain of 100 and a bandwidth of 200 kHz. **(i)**What will be the new bandwidth and gain if 5% negative feedback is introduced? **(8)** **(ii)**What should be the amount of feedback, if the bandwidth is restricted to 1 MHz? **(7)**	**BTL 5**	Evaluate
5.	Design a circuit of Transformer-coupled two stage amplifier	**BTL 6**	Create

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