INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATIONS ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**ELECTRONIC DEVICES AND CIRCUITS**
Course Code	:	**A30404**
Class	:	II B. Tech I Semester
Branch	:	CSE
Year	:	2016 – 2017
Course Coordinator	:	Mr. B. Naresh, Assistant Professor, Department of ECE
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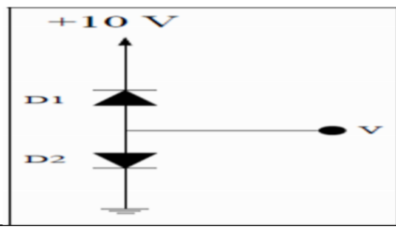
OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

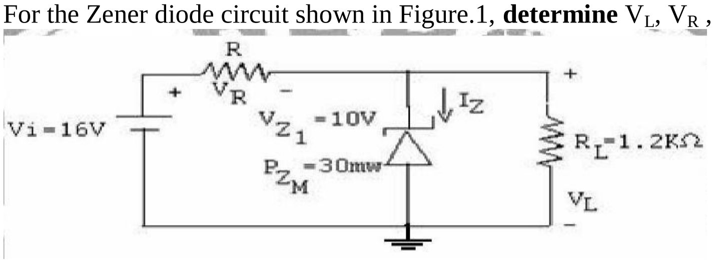
In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner"s learning process.

S. No	QUESTION	Blooms taxonomy level	Course Outcomes
	UNIT-I P-N JUNCTION DIODE		
Group – I (Short Answer Questions)			
1	**Define** Electronics?	Remember	1
2	**Explain** about forward bias of diode?	Understand	1
3	**Explain** about reverse bias of diode?	Understand	1
4	**Write** the Applications of diode?	Understand	3
5	**Draw** the V-I characteristics of diode?	Understand	2
6	**List** the differences between ideal diode and practical diode?	Remember	1
7	Define diffusion capacitance?	Remember	2
8	**Define** transition capacitance**?**	Remember	2
9	**Define** static resistance?	Remember	2
10	**Define** dynamic resistance	Remember	2
11	**Explain** the load line Analyze of diode?	Understand	2
12	**Write** the equation of diode current	Remember	2
13	**Define** Fermi level?	Remember	1

14	**Sketch** V-I characteristics of a PN diode for the following conditions: Rf= 0,Rr = 0, Vγ =0	Remember	2
Group – II (Long Answer Questions)			
1	**Define** Fermi level? By indicating the position of Fermi level in intrinsic, ntype and p- type semiconductor, explain its significance in semiconductors?	Remember	1
2	**Analyze** between drift and diffusion current in a semiconductor. State continuity equation?	Analyze	1
3	Sketch the V-I characteristics of p-n junction diode for forward bias voltages. Analyze between the incremental resistance and the apparent resistance of the diode?	Evaluate	2
4	**What** is potential energy barrier of the p-n junction? How does it arise and what is its order of magnitude?	Remember	2
5	Explain the temperature dependence of VI characteristics of PN diode?	Understand	2
6	**Derive** an expression for total diode current starting from Boltzmann relationship in terms of the applied voltage?	Remember	2
7	**Explain** the V-I characteristics of Zener diode and Analyze between Avalanche and Zener Break downs?	Understand	2
8	**Explain**in detail, the variation of following semiconductor parameters with temperature, i) Energy gap ii) Conductivity.	Understand	1
9	**Explain** the concept of diode capacitance. Derive expression for transition capacitance?	Understand	1
10	**Define** depletion region at p-n junction? What is the effect of forward and reverse biasing of p-n junction on the depletion region? Explain with necessary diagrams?	Remember	1
11	**Explain** Zener and avalanche breakdown mechanisms in detail?	Understand	1
12	**Differences** between 1. Static and dynamic resistances of a p – n diode. 2. Transition and Diffusion capacitances of a p – n diode	Analyze	2
13	**Difference** between 1. Volt – Ampere characteristics of a single silicon p – n diode and two identical silicon p- n diodes connected in parallel. 2. Avalanch and zener break down mechanisms	Analyze	2
14	**Explain** the tunneling phenomenon. Explain the characteristics of tunnel diode with the help of necessary energy band diagrams?	Understand	2
15	**What** is the photo diode? Explain its principle of operation and Applications in detail?	Remember	2
16	**Explain** the construction and working of photo diode?	Understand	2
17	**Explain** about Varactor diode with necessary sketches?	Understand	2
18	Sketch the static characteristics and firing characteristics of SCR and explain the shape of the curve?		2
19	**Explain**Schottky diode with necessary sketches?	Understand	2
20	**Explain** how a variable capacitance can be built using a varactor diode?	Understand	2
21	**Define** the following terms for a PN diode 1. Dynamic resistance 2. Load line. 3. Difference capacitance. 4. Reverse saturation current.	Remember	2
34	**List** the Applications of LED.	Analyze	1
35	**Draw** the two transistor equivalent circuit of a SCR	Analyze	1
38	**Define** holding current in a SCR?	Remember	1
39	**Draw** the V-I characteristics of SCR?	Analyze	2
40	**Explain** why a SCR is operated only in the forward biased condition?	Understand	2
41	**Explain** how triggering of an SCR can be controlled by the gate signal supplied?	Understand	1
42	**List** the Applications of varactor diode?	Analyze	1

43	**Define** photodiode?	Remember	
44	**Define** DIAC?	Remember	1
45	**Define** TRIAC?	Remember	1
Group - III (problems):			
1	**Find** the value of D.C. resistance and A.C resistance of a Germanium junction diode at 25^0 C with reverse saturation current, I_o = 25µA and at an applied voltage of 0.2V across the diode?	Analyze	2
2	The reverse saturation current of a silicon p – n function diode at an operating temperature of 27^0C is 50 nA.**Estimate** the dynamic forward and reverse resistances of the diode for applied voltages of 0.8 V and -0.4 V respectively?	Evaluate	2
3	The circuit shown in Figure (3.2) uses identical diodes for which ID = 1 mA at VD = 0.7 V with n = 1. At 20◦C, voltage V is measured by a very high resistance meter to be 0.1 V. By what factor does the reverse leakage current of these diodes exceed Is? **Estimate** the value of V when the temperature is raised by 50◦C. 	Evaluate	2
4	A P-N junction germanium diode has a reverse saturation current of 0.10 µA at the room temperature of 27^0C.It is observed to be 30µA,when the room temperature is increased. **Evaluate** the room temperature?	Evaluate	2
5	**Find** the factor by which the reverse saturation current of a silicon diode will get multiplied when the temperature is increased from 27^0 C to 82^0C?	Remember	2
6	**Determine** the values of forward current in the case of P-N junction diode, with I_0=10 µA Vf=0.8V at T=300^0K.Assume silicon diode?	Evaluate	2
7	A p-n junction diode has a reverse saturation current of 30 µA at a temperature of 125^0 C. At the same temperature, **find** the dynamic resistance for 0.2 V bias in forward and reverse direction?	Remember	2
8	The voltage across a silicon diode at room temperature of 300^0K is 0.7 V when 2 ma current flows through it. If the voltage increases to 0.75 v, **Evaluate** the diode current assuming V_T=26mv.	Evaluate	2
9	**Determine** the dynamic forward and reverse resistance of p-n junction silicon diode when the applied voltage is 0.25 V at T=3000K with give I0=2 µA?	Evaluate	2
UNIT-II RECTIFIERS AND FILTERS			
Group - I (Short Answer Questions)			
1	**Define** rectifier?	Remember	4
2	**Define** ripple factor?	Remember	3
3	**Compare** the rectifier and regulator?	Understand	3
4	**Define** transformer utilization factor?	Remember	3
5	**Define** efficiency?	Remember	3
6	**Define** full wave rectifier?	Remember	3
7	**What** are the merits of full wave rectifier?	Apply	3
8	**List** the disadvantages of full wave rectifier?	Analyze	3
9	**Draw** the block diagram of shunt voltage regulator?	Remember	3
10	**Draw** the block diagram of series voltage regulator?	Remember	3
11	**Define** regulator?	Remember	3
12	**Draw** the circuit diagram of half wave rectifier?	Create	4
13	**Draw** the circuit diagram of full wave rectifier?	Evaluate	4
14	**Define** line regulation and load regulation?	Remember	4

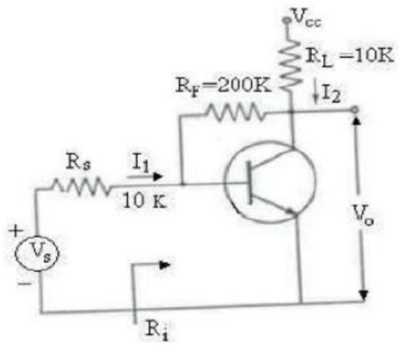
15	**Give** the advantages and disadvantages of HWR and FWR?	Remember	4
16	**What** is the need for a filter in rectifier?	Remember	4
17	What is the need for voltage regulators? What are the drawbacks of unregulated power supply?	Remember	4
18	**Draw** the circuit diagram of π-section filter?	Remember	4
19	Explain about zener regulator?	Understand	4
20	Draw the circuit diagram of L-section filter?	Understand	4
Group– II (Long Answer Questions)			
1	Draw the block diagram of a regulated power supply and explain its operation?	Understand	3
2	Draw the circuit of a half-wave-rectifier and find out the ripple factor, % regulation? Efficiency and PIV?	Analyze	4
3	Draw the circuit of bridge rectifier and explain its operation with the help of input and output waveforms?	Analyze	4
4	**With** suitable diagrams, **explain** the working of centre-tapped full wave rectifier. Derive expressions for V_{DC}, I_{DC}, V_{rms} and I_{rms} for it?	Understand	4
5	**Explain** the relative merits and demerits of all the rectifiers?	Understand	3
6	**Compare** the performance of Inductor filter and capacitor filter?	Understand	3
7	**Derive** the expression for the ripple factor of π-Section filter when used with a Half-wave-rectifier. Make necessary approximations?	Analyze	4
8	**Derive** the expression for the ripple factor of π-Section filter when used with a Full-wave-rectifier. Make necessary approximations?	Analyze	4
9	**Define** Ripple factor and form factor. Establish a relation between them?	Remember	3
10	**Explain** the necessity of a bleeder resistor in an L – section filter used with a Full Wave filter?	Understand	4
11	**List** out the merits and demerits of Bridge type Full Wave rectifiers over centre tapped type Full Wave rectifiers?	Analyze	3
12	**Explain** about multiple L-section and multiple π-section filters?	Understand	4
13	**Compare** the performance of series inductor,l-section and π-section filters?	Understand	4
14	**Explain** the operation of inductor filter and derive expression for ripple factor?(FWR)	Understand	4
15	**Explain** the operation of L-section filter and derive expression for ripple factor?(FWR)	Understand	4
9	Explain about transistor amplifier?	Understand	5
10	Define current amplification factor?	Remember	5
11	When does a transistor act as a switch?	Understand	5
12	Explain about the various regions in a transistor?	Understand	5
13	Draw the small signal model of a CE configuration?	Remember	6
	Group - III (problems):		
1	A full wave bridge rectifier having load resistance of 100Ω is fed with 220V, 50Hz through a step-down transformer of turns ratio 11:1.		
	Assuming the diodes ideal, **find** i) DC output voltage ii)Peak inverse voltage iii) Rectifier efficiency.	Evaluate	4
2	**Determine** the ripple factor of an L-section filter comprising a 10H choke and 8μF capacitor, used with a FWR. The DC voltage at the load is 50V. Assume the line frequency as 50Hz?	Evaluate	4
3	A bridge rectifier uses four identical diodes having forward resistance of 5Ω each. Transformer secondary resistance is 5 ohms and the secondary voltage is 30V (rms). **Determine** the dc output voltage for I_{dc} = 200 mA and value of the output ripple voltage?	Evaluate	4
4	A 230 V, 60Hz voltage is applied to the primary of a 5:1 step down, center tapped transformer used in a full wave rectifier having a load of 900Ω. If the diode resistance and the secondary coil resistance together have a resistance of 100 Ω, **determine**	Evaluate	4

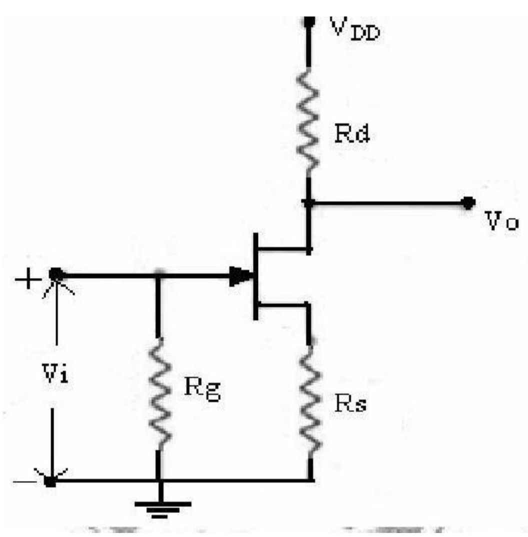
	i) DC voltage across the load. ii) DC current flowing through the load. iii)DC power delivered to the load. iv) PIV across each diode.		
5	A HWR circuit supplies 100mA DC current to a 250Ω load. **Find** the DC output voltage, PIV rating of a diode and the r.m.s. voltage for the transformer supplying the rectifier?	Evaluate	4
6	A full wave rectifier circuit uses two silicon diodes with a forward resistance of 20Ω each. A DC voltmeter connected across the load of 1KΩ reads 55.4 volts. **Calculate** i) I_{rms} ii) Average voltage across each diode iii) ripple factor iv) Transformer secondary voltage rating.	Evaluate	4
7	**What** is the ripple factor if a power supply of 220 V, 50 Hz is to be Full Wave rectified and filtered with a 220µF capacitor before delivering to a resistive load of 120Ω? Compute the value of the capacitor for the ripple factor to be less than 15%.	Remember	4
8	For the Zener diode circuit shown in Figure.1, **determine** V_L, V_R , I_Z& R? 	Evaluate	4
9	In a Zener diode regulator, the supply voltage = 300V, V_z = 220V, I_z = 15mA and load current = 25mA. **Determine** the value of resistor required to be connected in series with the Zener diode?	Evaluate	4
10	A bridge rectifier uses four identical diodes having forward resistance of 5Ω each. Transformer secondary resistance is 5Ω and the secondary voltage of 30V(rms).**Determin**e the dc output voltage for I_{DC}=200mA and the value of the ripple voltage.	Evaluate	4
22	Define amplifier?	Remember	6
23	Draw the hybrid model of a CB configuration?	Remember	6
24	Write a note on transistor construction?	Understand	6
25	What are the differences between BJT and UJT?	Understand	6
26	Draw the equivalent circuit of a UJT	Understand	6
27	Draw the V-I characteristics of UJT?	Analyze	6
28	What do you mean by regeneration in UJT?	Understand	6
29	Explain the terms peak voltage and valley current in UJT?	Understand	6
30	Explain the terms peak voltage and valley current in UJT?	Remember	6
UNIT-III **BIPOLAR JUNCTION TRANSISTOR AND UJT**			
Group – I (Short Answer Questions)			
1	Define Transistor?	Remember	5
2	What is meant by operating point Q?	Understand	5
3	Draw the symbols of NPN and PNP transistor?	Understand	5
4	Explain the operation of BJT and its types?	Understand	5
5	Explain the breakdown in transistor?	Understand	5
6	Explain the transistor switching times?	Understand	5
7	Define Transistor current?	Remember	5
8	Define early effect or base width modulation?	Remember	5
9	Explain about transistor amplifier?	Understand	5
10	Define current amplification factor?	Remember	5

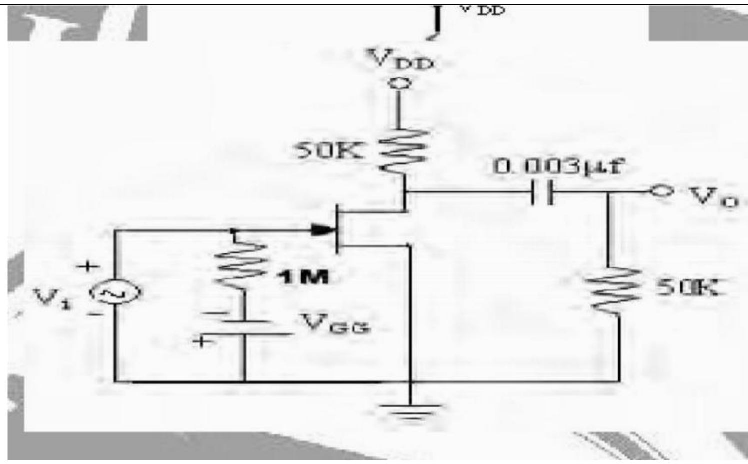
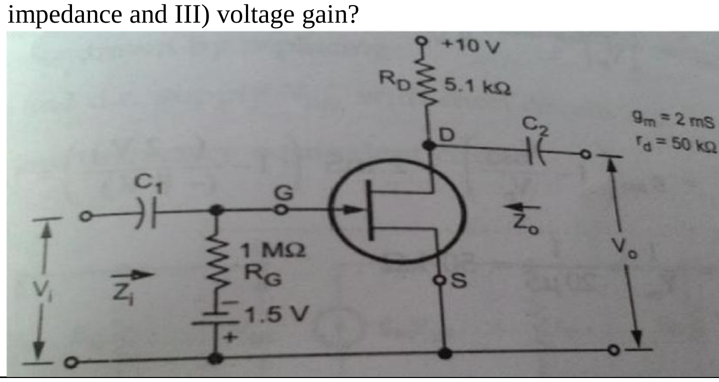
11	When does a transistor act as a switch?	Understand	5
12	Explain about the various regions in a transistor?	Understand	5
13	Draw the small signal model of a CE configuration?	Remember	6
14	Draw the output characteristics of NPN transistor in CE configuration?	Understand	6
15	Define h_{ie} and h_{fe} in CE configuration?	Remember	6
16	Define hoe and h_{re} in CB configuration?	Remember	6
17	Define saturation region?	Remember	6
18	Write the relation between I_C, β, I_B and I_{CBO} in a BJT?	Remember	6
19	Write the relation between I_C, β, I_B and I_{CBO} in a BJT?	Remember	6
20	Define active region?	Remember	6
21	Describes the various current components in a BJT?	Remember	6
22	Define amplifier?	Remember	6
23	Draw the hybrid model of a CB configuration?	Remember	6
24	Write a note on transistor construction?	Understand	6
25	What are the differences between BJT and UJT?	Understand	6
26	Draw the equivalent circuit of a UJT	Understand	6
27	Draw the V-I characteristics of UJT?	Analyze	6
28	What do you mean by regeneration in UJT?	Understand	6
29	Explain the terms peak voltage and valley current in UJT?	Understand	6
30	Explain the terms peak voltage and valley current in UJT?	Remember	6
Group – II (Long Answer Questions)			
1	With a neat diagram **explain** the various current components in an NPN bipolar junction transistor & hence derive general equation for collector current, I_C?	Understand	5
2	**Define** Early-effect; explain why it is called as base-width modulation? Discuss its consequences in transistors in detail?	Remember	5
3	**How** transistor acts as an amplifier?	Remember	6
4	**Draw** the input and output characteristics of a transistor in common emitter configurations?	Understand	6
5	**Draw** the input and output characteristics of a transistor in common base configurations?	Evaluate	6
6	**Draw** the input and output characteristic of a transistor in common collector configurations?	Understand	6
7	**Explain** the constructional details of Bipolar Junction Transistor?	Understand	6
8	**Derive** the relation among α, β and γ?	Evaluate	6
9	**What** is thermal runaway in transistors? Obtain the condition for thermal stability in transistors?	Remember	6
10	**Describe** the significance of the terms, „α‟ and „β‟. Establish a relation between them?	Evaluate	6
11	**Explain** how the UJT can be used as a negative-resistance device with the aid of static characteristics?	Understand	6
12	**Give** the construction details of UJT & **explain** its operation with the help of equivalent circuits?	Understand	6
13	**Explain** any two construction techniques of construction of transistor**?**	Understand	6
14	**Explain** the Apply of a UJT as a relaxation oscillator?	Understand	6
15	With reference to bipolar junction transistors, **define** the following terms and explain. Emitter efficiency, Base Transportation factor and Large signal current gain.	Understand	6
Group - III (problems):			
1	**Determine** the values of I_C and I_E for a transistor with $\boldsymbol{\alpha}_{dc}$ = 0.99 and I_{CBO} = 5μA, if I_B is measured as 20 μA ?	Evaluate	6
2	**Determine** the collector current and emitter current for a transistor with α = 0.99 and I_{CBO} = 490μA when the base current is 19μA?	Evaluate	6
3	The reverse leakage current of the transistor when connected in CB	Evaluate	6

	configuration is 0.2 μA while it is 18 μA when the same transistor is connected in CE configuration. **Determine** α and β of the transistor?		
4	For an NPN transistor with α_N = 0.98, J_{CO}= 2μA and I_{EO} = 1.6μA connected in Common Emitter Configuration, **Determine** the minimum base current for which the transistor enters into saturation region. V_{CC} and load resistance are given as12 V and 4.0 KΩ respectively?	Evaluate	6
5	If the base current in a transistor is 20μA when the emitter current is 6.4mA, what are the values of α_{dc} and $\beta_{dc?}$ Also **determin**e the collector current?	Evaluate	6
6	In a certain transistor, the emitter current is 1.02 times as large as the collector current. If the emitter current is 12 mA, **find** the base current?	Evaluate	6
7	A)**Find**α_{dc} foreach of the following values of βdc=50 and 190. B)**Find** βdc for each of the following values of $\alpha_{dc=}$0.995 and 0.9765	Evaluate	6
8	In a certain transistor, the emitter current is 1.09 times as large as the collector current. If the emitter current is 10 mA, **find** the base current?	Evaluate	6
UNIT-IV TRANSISTOR BIASING AND STABILIZATION			
Group – I (Short Answer Questions)			
1	Define biasing?	Remember	7
2	Why biasing is necessary in BJT amplifiers?	Remember	7
3	Define Q-point?	Remember	7
4	Explain the concept of dc load line with the help of neat diagram?	Remember	7
5	Draw and explain the ac load line?	Evaluate	7
6	Define three stability factors?	Remember	7
7	Which biasing method provides more stabilization amongst the three types of biasing methods?	Apply	7
8	Compare the advantages and disadvantages of biasing schemes?	Remember	7
9	Draw the circuit diagram of a collector to base bias circuit of CE amplifier?	Evaluate	8
10	Write down advantages of fixed bias circuitry?	Understand	7
11	Draw the circuit diagram of a fixed bias circuit of CE amplifier?	Remember	8
12	Draw a circuit employing a sensistor compensation?	Apply	8
13	Write down disadvantages of fixed bias circuit?	Apply	8
14	Define thermal runaway?	Remember	7
15	Define thermal resistance?	Remember	7
16	Define stability factors s‟ and s‟‟‟?	Remember	7
17	Define thermal stability	Remember	7
18	Draw the circuit diagram of a self-bias circuit of CE amplifier?	Analyze	8
19	Draw the circuit diagram of a emitter feedback bias circuit of CE amplifier?	Apply	8
20	List out the different types of biasing methods?	Analyze	8
21	A Ge transistor having β=100 and Vbe=0.2v is used in a fixed bias amplifier circuit where Vcc=16v,Rc=5 KΩ and R_B= 790 KΩ determine its operating point.	Analyze	8
22	Differentiate bias stabilization and compensation techniques?	Evaluate	8
Group – II (Long Answer Questions)			
1	**Define** biasing? Draw the fixed bias circuit and obtain the expression for the stability factor?	Remember	7
2	**Draw** the collector-emitter feedback bias circuit and obtain the expression for the stability factor?	Understand	8
3	**Draw** the self-bias circuit and obtain the expression for the stability factor. Discuss the advantages and disadvantages of self-biasing?	Remember	7
4	**Draw** the emitter feedback bias circuit and obtain the expression for the stability factor?	Understand	8
5	**Define** „Thermal Runaway‟ in transistors? Derive the condition to prevent „Thermal Runaway‟ in Bipolar Junction Transistors?	Remember	9
6	**Draw** the circuit diagram & small signal equivalent of CB amplifier using	Apply	9

	accurate h-parameter model. Derive expressions for A_V, A_I, R_i and R_0?		
7	**Draw** the circuit diagram of CC amplifier using hybrid parameters and derive expressions for A_I, A_V, R_i, R_O?	Apply	10
8	**What** are the compensation techniques used for V $_{BE}$andI$_{CO}$. Explain with help of suitable circuits?	Remember	7
9	Define the stability factors with respect to the changes in ICO, VBE and β. Why is the stability with respect to changes in VCE not considered?	Remember	8
10	**Justify** statement "Potential divider bias is the most commonly used biasing method" for BJT circuits. Explain how bias compensation can be done in such biasing through diodes?	Evaluate	9
11	**Determine** the significance of operating point, DC and AC load lines to ensure active region operation of a BJT in CE amplifier Apply?	Evaluate	10
Group - III (problems):			
1	**Design** a collector to base bias circuit using silicon transistor to achieve a stability factor of 20, with the following specifications: V_{CC} = 16V, V_{BE} = 0.7V, V_{CEQ} = 8V,Icq=4ma & β=50?	Create	9
2	**Draw** small signal equivalent circuit of Emitter Follower using accurate hparameter model. For the emitter follower circuit with R_S = 0.5K and R_L = 5K, calculate R_i, A_V and $R_{O.}$ Assume, h_{fe} = 50, h_{ie} =1K, h_{oe} = 25 µA/V.		10
3	A silicon NPN transistor has Ico = 20nA and β=150, V_{be} = 0.7V. It is operated in Common Emitter configuration having Vbb = 4.5V,R_b= 150K,R_c = 3K, V_{cc} = 12V. Find the emitter, base and collector currents and also verify in which region does the transistor operate. **What** will happen if the value of the collector resistance is increased to very high values?	Remember	10
4	**Design** a self bias circuit using silicon transistor to achieve a stability factor of 10, with the following specifications: V_{CC} = 16V, V_{BE} = 0.7V, V_{CEQ} = 8V, I_{CQ} = 4 mA & β= 50?	Create	9
5	A bipolar junction transistor with h_{ie} = 1100Ω, h_{fe} = 50, h_{re} = 2.4x10^{-4}, h_{oe} = 25 µA/V, is to drive a load of 1KΩ in Emitter-Follower arrangement. **Estimate** A_V, A_I, R_i& R_0?	Evaluate	10
6	**Design** an Emitter bias circuit using silicon transistor to achieve a stability factor of 20, with the following specifications: V_{CC} = 16V, V_{BE} = 0.7V, V_{CEQ} = 8V, I_{CQ} = 4 mA & β= 50.	Create	9
7	A bipolar junction transistor with h_{ie} = 1100Ω, h_{fe} = 50, h_{re} = 2.4x10^{-4}, h_{oe} = 25 µA/V, is to drive a load of 1KΩ in CB amplifier arrangement. **Estimate** A_V, A_I, R_i& R_0?	Evaluate	9
8	**Design** a fixed bias circuit using silicon transistor, with the following specifications: V_{CC} = 16V, V_{BE} = 0.7V, V_{CEQ} = 8V, I_{CQ} = 4 mA & β= 50?	Evaluate	10
9	**Design** a self-bias circuit using silicon transistor to achieve a stability factor of 10, with the following specifications: V_{CC} = 16V, V_{BE} = 0.7V, V_{CEQ} = 8V, I_{CQ} = 4 mA & β = 50?	Evaluate	10
10	**Design** a self-bias circuit for the following specifications: V_{CC}= 12 V; V_{CE} Assume any other design parameters required. Draw the designed circuit.	= 2V; IEvaluate$_C$ = 4	mA; h_{fe}10 = 80.
11	**Compute** current gain, voltage gain, input and output impedance of the CB amplifier if it is driven by a voltage source of internal resistance Rs=1k.The load impedance is RL=1K. The transistor parameters are hib= 22, hfb= -0.98, hrb=2.9×10−4, hob= 0.5µA/V.	Analyze	9
12	**Determine** AI , AV , RI , R0.of a transistor with hie=1.1K, hfe=50, hre=205X10−4 , hoe=25µA/V is connected in CE configuration as shown in fig.	Evaluate	9

			
13	A common collector circuit has the following components R1=27kΩ, R2=27kΩ, Re=5.6kΩ, RL=47kΩ, Rs=600Ω. The transistor parameters are hie=1kΩ, hfe=85 and hoe=2μA/V. **Determine** Ai, Ri, Av, Ro.	Evaluate	9
14	A common Emitter circuit has the following,components.Rs=1k,R1=110K,R2=12K Rc=6K.h-parameters are hie=1.2K,hre=2.5*10^{-4} ,hfe=75,hoe=25uA/V.**Draw** the equivalent hybrid model and calculate Ai,Ri,Ro and Av?	Evaluate	9
15	The h-parameters of a transistor used in a CE circuit are hie = 1.0 K, hre= 10×10−4, hfe = 50, hoe = 100 K. The load resistancefor the transistor is 1 K in the collector circuit. **Determine**Ri, Ro, AV & Ai in the amplifier stage (Assume Rs = 1000)?	Evaluate	9
UNIT-V **Field Effect Transistor and FET Amplifiers**			
Group - I (Short Answer Questions)			
1	Why FET is called a voltage operated device?	Evaluate	11
2	List the important features of FET?	Remember	11
3	Draw the functional diagram of JFET?	Remember	11
4	Write short notes on millers theorem?	Remember	11
5	Give the classifications of FETs and their Apply areas?	Remember	11
6	Define pinch off voltage?	Understand	11
7	Draw the structure of an n-channel JFET?	Remember	11
8	Define rd and Gm?	Remember	11
9	Draw the static characteristics curves of an n-channel JFET?	Understand	12
10	Draw the drain characteristics of depletion type MOFET?	Remember	12
11	Draw the small signal model of JFET?	Remember	11
12	Draw the transfer characteristics for P-channel JFET?	Understand	12
13	Draw the Drain V_I characteristics for p-channel JFET?	Remember	12
14	Explain about ohmic and saturation regions?	Understand	12
15	Draw the drain characteristics of an n-channel enhancement type MOSFET?	Remember	12
Group – II (Long Answer Questions)			
1	**Explain** the operation of FET with its characteristics and explain the different regions in transfer characteristics?	Understand	11
2	**Define** pinch-off voltage and trans conductance in field effect transistors?	Understand	12
3	With the help of neat sketches and characteristic curves **explain** the construction & operation of a JFET and mark the regions of operation on the characteristics?	Apply	12
4	**Explain** how a FET can be made to act as a switch?	Remember	11
5	Bring out the differences between BJT and FET. **Compare** the three configurations of JFET amplifiers?	Remember	13
6	**Create** a relation between the three JFET parameters, μ, r_d and g_m?	Create	11
7	**How** a FET can be used as a voltage variable Resistance (VVR)?	Remember	11
8	**Explain** the construction & operation of a P-channel MOSFET in enhancement and depletion modes with the help of static drain characteristics and transfer characteristics?	Understand	12

9	**Sketch** the drain characteristics of MOSFET for different values of V_{GS}& mark different regions of operation.	Understand	12
10	**Explain** the principle of CS amplifier with the help of circuit diagram. Derive the expressions for A_V, input impedance and output Impedance?	Understand	12
11	**Write** the expressions for mid-frequency gain of a FET Common Source?	Remember	12
12	Discuss the high frequency response of CD Configuration?	Remember	12
13	**What** is the effect of external source resistance on the voltage gain of a common source amplifier? Explain with necessary derivations?	Remember	12
14	**Draw** the small-signal model of common drain FET amplifier. Derive expressions for voltage gain and output resistance?	Analyze	11
15	**Draw** the small-signal model of common source FET amplifier. Derive expressions for voltage gain and output resistance?	Analyze	11
16	**Draw** the small-signal model of common gate FET amplifier. Derive expressions for voltage gain and output resistance?	Analyze	11
17	L**ist** any four merits of MOSFET to show that they are more suitable than JFETS in Integrated circuits?	Remember	11
18	**Compare** enhancement and depletion modes of a MOSFET with the help of its characteristics and construction?	Analyze	12
19	With a neat schematic, **explain** how amplification takes place in a common drain amplifier?	Understand	11
20	**Explain** the significance of threshold voltage of a MOSFET. Discuss the methods to reduce threshold voltage, V_T?	Understand	11
21	Derive the expression for transconductance of MOSFET?	Analyze	12
Group - III (problems):			
1	A Common Source FET amplifier circuit shown in Figure.2 with unbypassed R_S has the following circuit parameters: R_d = 15K, R_S = 0.5K, Rg = 1M, r_d = 5K, g_m= 5mS and V_{DD} = 20 V. Calculate A_V, A_I, R_i and R_0? 	Evaluate	13
2	In an n-channel FET, the effective channel width is 3x 10^{-4}cm and the donor impurity concentration is 10^{15} electrons/cm^3. **Find** the pinch-off voltage?	Evaluate	13
3	In the common source FET amplifier shown in Figure.1, the trans conductance and drain dynamic resistance of the FET are 5mA/V and 1MΩ respectively.**Estimate** A_V, R_i& R_0?	Evaluate	14

			
4	A Common Source FET amplifier circuit with un bypassed R_S has the following circuit parameters: R_d = 15K, R_S = 0.5K, Rg = 1M, r_d = 5K, g_m= 5mS and V_{DD} = 20 V. **Determine** A_V& $R_{O?}$	Evaluate	12
5	A self-biased p – channel JFET has a pinch – off voltage of V_P = 5 V and I_{DSS} = 12 mA. The supply voltage is 12 V. **Determine** the values of R_D and R_S so that I_D = 5 mA and V_{DS} = 6V?	Evaluate	12
6	For the circuit shown in fig.**Determine**i) Input impedance II) output impedance and III) voltage gain? 	Evaluate	13
7	The P-channel FET has a $\|I_{DS\|}$=-12mA, |Vp|=5V, V_{GS} is 1.6 V. **Determine**I_D ,G_m and G_{m0} ?	Evaluate	14
8	Data sheet for a JFET indicates that IDS=10mA and V_{GS}(off)= -4V. **Determine** the drain current for V_{GS}=0V, -1V and -4V.	Evaluate	14

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