INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

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

OBJECTIVES

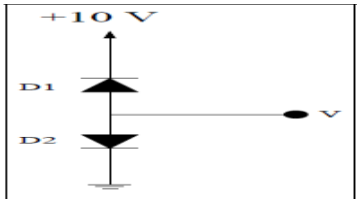
To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure 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 Outcome
	UNIT-I **P-N JUNCTION DIODE** **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

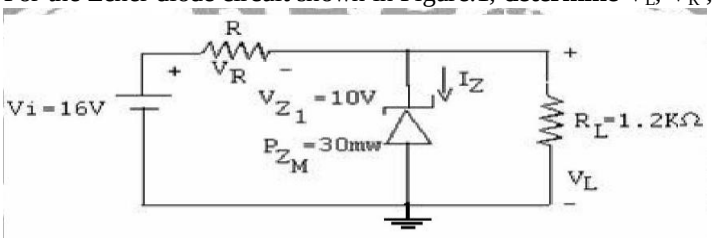
15	**Sketch** V-I characteristics of a PN diode for the following conditions: $R_F = 0, R_r = 0, V\gamma = 0.6$	Understand	2
16	**Define** reverse saturation current?	Remember	1
17	**Define** cut-in voltage?	Remember	1
18	**Write** the differences between avalanche and zener breakdown mechanisms?	Remember	1
19	**Define** zener breakdown mechanism?	Remember	1
20	**Define** depletion region?	Remember	1
21	**Explain** the temperature dependence of VI characteristics of PN diode?	Understand	1
22	**Define** doping?	Remember	1
23	**Explain** about extrinsic semiconductor	Understand	1
24	**Explain** about unbiased PN junction?	Understand	1
25	**Write** down the expression for diode current?	Remember	1
26	**Define** drift current?	Remember	1
27	**List** the Applications of Zener diode?	Analyze	1
28	**Define** forbidden energy gap?	Remember	1
29	**With** appropriate circuit diagram explain the DC load line Analyze of semiconductor diode?	Analyze	1
30	**Define** Peak Inverse voltage of a diode?	Remember	1
31	**What** is the principle of operation of photodiode?	Remember	1
32	**Give** the principle of operation of Light Emitting Diode?	Analyze	1
33	**Define** diffusion current?	Remember	1
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
	LONG ANSWER QUESTIONS		
1	**Define** Fermi level? By indicating the position of Fermi level in intrinsic, n-type 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	Understand	1

	with temperature, i) Energy gap ii) Conductivity.		
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
	ANALYTICAL QUESTIONS		
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	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
4	**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
5	**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
6	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
7	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
8	**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
9	**Find** the value of D.C. resistance and A.C resistance of a Germanium junction diode at 30^0 C with reverse saturation current, I_o = 10µA and at an applied voltage of 0.6V across the diode?	Analyze	2
10	The reverse saturation current of a Ge p – n function diode at an operating temperature of 25^0C is 40 nA. **Estimate** the dynamic forward resistances of	Evaluate	2

	the diode for applied voltages of 0.6 V and -0.2 V respectively?		
11	A P-N junction germanium diode has a reverse saturation current of 10μA at the room temperature of 27^0C.It is observed to be 40μA,when the room temperature is increased. **Evaluate** the room temperature?	Evaluate	2
12	**Find** the factor by which the reverse saturation current of a silicon diode will get multiplied when the temperature is increased from 30^0 C to 42^0C?	Remember	2
13	**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 germanium diode?	Evaluate	2
14	A p-n junction diode has a reverse saturation current of 20 μA at a temperature of 100^0 C. At the same temperature, **find** the dynamic resistance for 0.4 V bias in forward and reverse direction?	Remember	2
15	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
	UNIT -2 **RECTIFIERS AND FILTERS** **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
	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, %	Analyze	4

	regulation? Efficiency and PIV?		
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
	ANALYTICAL QUESTIONS		
1	A HWR circuit supplies 50mA DC current to a 200Ω 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
2	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
3	**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
4	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
5	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** 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.	Evaluate	4
6	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
7	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
8	**What** is the ripple factor if a power supply of 220 V, 50 Hz is to be Full	Remember	4

[9+6]

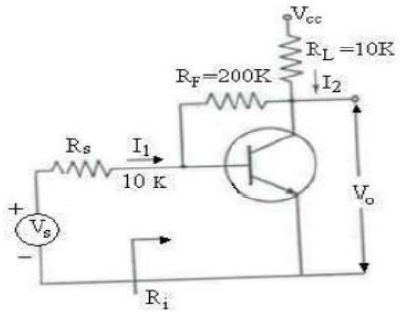
	Wave rectified and filtered with a 220μF capacitor before delivering to a resistive load of 120Ω? Compute the value of the capacitor for the ripple factor to be less than 15%.		
9	For the Zener diode circuit shown in Figure.1, **determine** V_L, V_R , I_Z& R? 	Evaluate	4
10	In a Zener diode regulator, 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
11	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).**Determine** the dc output voltage for I_{DC}=200mA and the value of the ripple voltage.	Evaluate	4
12	A full wave bridge rectifier having load resistance of 1000Ω is fed with 220V , 50Hz through a step-down transformer of turns ratio 11:1. Assuming the diodes ideal, **find** i) DC output ii) rectifier efficiency.	Evaluate	4 [9+6]
13	**Determine** the ripple factor of an L-section filter comprising a 20H choke and 10μF capacitor, used with a FWR. The DC voltage at the load is 40V. Assume the line frequency as 50Hz?	Evaluate	4
14	A bridge rectifier uses four identical diodes having forward resistance of 10Ω each. Transformer secondary resistance is 5 ohms and the secondary voltage is 20V (rms). **Determine** the dc output voltage for I_{dc} = 100 mA and value of the output ripple voltage?	Evaluate	4
15	**What** is the ripple factor if a power supply of 220 V, 50 Hz is to be Full Wave rectified and filtered with a 20μF capacitor before delivering to a resistive load of 1000Ω? Compute the value of the capacitor for the ripple factor to be less than 10%.	Remember	4
	UNIT-3 **BIPOLAR JUNCTION TRANSISTOR AND UJT** **SHORT ANSWER QUESTIONS**		
1	Define Transistor?	Remember	5
2	What is a bipolar junction transistor? How are its terminals named?	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 output characteristics of NPN transistor in CE configuration?	Understand	6
14	Define saturation region?	Remember	6
15	Write the relation between I_C, β, I_B and I_{CBO} in a BJT?	Remember	6

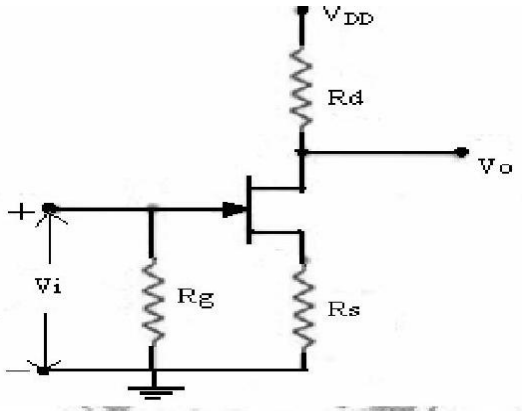
16	Define active region?	Remember	6
17	Describes the various current components in a BJT?	Remember	6
18	Define amplifier?	Remember	6
19	Draw the hybrid model of a CB configuration?	Remember	6
20	Write a note on transistor construction?	Understand	6
21	Calculate the values of collector current and base current for a transistor with α_{dc}= 0.99, I_{CBO}= 10µA and I_E=8mA.	Apply	6
22	If β = 100, I_{CBO}= 10µA and I_B = 80 µA find I_E	Apply	6
23	If α_{dc}= 0.98, I_{CBO}= 10µA and I_B = 100 µA find I_E	Apply	6
24	Find α_{dc} If β = 50.	Apply	6
25	Find β if α_{dc}= 0.995	Apply	6
26	Calculate the values of collector current and base current for a transistor with α_{dc}= 0.98, I_{CBO}= 10µA and I_E=6mA.	Apply	6
27	If β = 80, I_{CBO}= 10µA and I_B = 90 µA find I_E	Apply	6
28	If α_{dc}= 0.96, I_{CBO}= 5µA and I_B = 110 µA find I_E	Apply	6
29	Find α_{dc} If β = 100.	Apply	6
30	Find β if α_{dc}= 0.945	Apply	6
	MID-2		
1	Draw the small signal model of a CE configuration?	Remember	6
2	Define h_{ie} and h_{fe} in CE configuration?	Remember	6
3	Define hoe and h_{re} in CB configuration?	Remember	6
4	What are the differences between BJT and UJT?	Understand	6
5	Draw the equivalent circuit of a UJT	Understand	6
6	Draw the V-I characteristics of UJT?	Analyze	6
7	What do you mean by regeneration in UJT?	Understand	6
8	Explain peak voltage of UJT?	Understand	6
9	Explain vally voltage of UJT?	Remember	6
10	Define h_{ie} and h_{fe} in CC configuration?	Remember	6
11	Define h_{ie} and h_{fe} in CB configuration?	Remember	6
12	Define hoe and h_{re} in CE configuration?	Remember	6
13	Define hoe and h_{re} in CC configuration?	Understand	6
14	Draw the h model for CB configuration?	Understand	6
15	Draw the h model for CC configuration?	Analyze	6
16	Illustrate the working of CE amplifier?	Understand	6
17	Define intrinsic stand -off ratio in UJT?	Remember	6
18	Determine the intrinsic stand-off ratio of UJT, if R_{BB} = 10K ohms and R_{B2} = 4k ohms.	Remember	6
19	Sketch the h-model of CE configuration?	Remember	6
20	Sketch the h-model of CB configuration?	Understand	6
21	Sketch the h-model of CC configuration?	Understand	6
22	Evaluate the intrinsic stand-off ratio of UJT, if R_{BB} = 20K ohms and R_{B2} = 8k ohms.	Analyze	6
23	Determine the base, collector and emitter currents and V_{CE} for a CE circuit, if V_{CC} = 10V, V_{BB} = 4V, R_B = 200k ohms, R_C = 2k ohms, β = 100.	Remember	6
24	Determine the R_{B1} for UJT if η = 0.6, R_{B2} = 10k ohms?	Remember	6
25	Determine the R_{B2} for UJT if R_{BB} = 10k ohms, R_{B1} = 6k ohms?	Remember	6
26	Evaluate the intrinsic stand-off ratio of UJT, if R_{BB} = 15K ohms and R_{B2} =	Understand	6

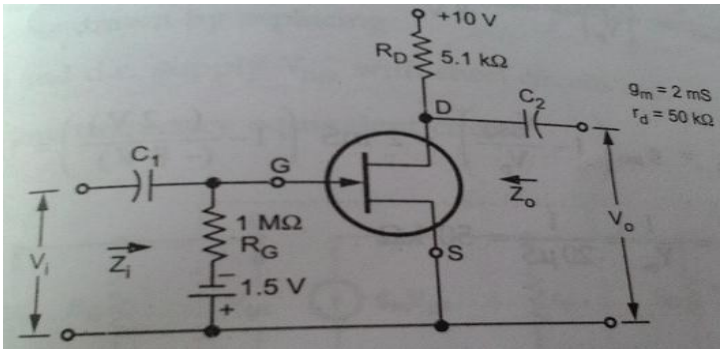
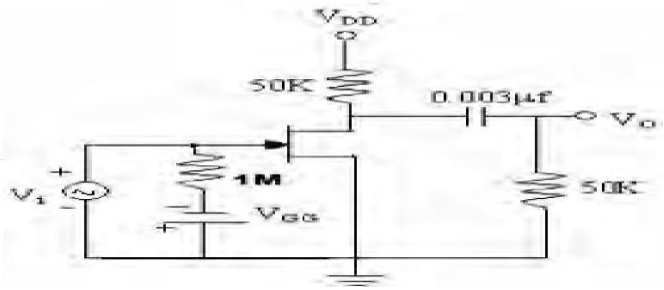
	5k ohms.		
27	Determine the base, collector and emitter currents and V_{CE} for a CE circuit, if V_{CC} = 12V, V_{BB} = 2V, R_B = 100k ohms, R_C = 2k ohms, β = 50.	Remember	6
28	Determine the R_{B1} for UJT if η = 0.8, R_{B2} = 8k ohms?	Remember	6
29	Determine the R_{B2} for UJT if R_{BB} = 20k ohms, R_{B1} = 4k ohms?	Remember	6
30	Determine the base, collector and emitter currents and V_{CE} for a CE circuit, if V_{CC} = 14V, V_{BB} = 4V, R_B = 200k ohms, R_C = 4k ohms, β = 150.	Understand	6
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	How UJT is acts 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
ANALYTICAL QUESTIONS			
1	Determine the values of I_C and I_E for a transistor with α_{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} = 40μA when the base current is 19μA?	Evaluate	6
3	The reverse leakage current of the transistor when connected in CB 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?	Evaluate	6
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 determine 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
9	For a transistor, $\beta = 100$ and voltage drop across R_C is 2 volts . find the base current . assume $R_C = 2$Kohms.		
10	Determine the collector current and emitter current for a transistor with $\alpha = 0.99$ and $I_{CBO} = 50\mu A$ when the base current is $20\mu A$?	Evaluate	6
11	A transistor operating in CB configuration has Ic = 2.98mA, Ie = 3mA, Ico = 0.01mA. what current will flow the collector circuit, of this transistor when connected in CE configuration with base current of 30 microamps.	Evaluate	6
12	The reverse leakage current of the transistor when connected in CB configuration is 0.4 μA while it is 20 μA when the same transistor is connected in CE configuration. Determine α and β of the transistor?	Evaluate	6
13	For a transistor, $\beta = 150$ and voltage drop across R_C is 5 volts . find the base current . assume $R_C = 5$Kohms.	Evaluate	6
14	In a certain transistor 99.5% of the carriers injected in to the base cross the CB junction. If the leakage current is 6 microamps and the collector current is 10mA, calculate the value of α, emitter current.	Evaluate	6
15	In a UJT relaxation oscillator $R_T = 5$K ohms, $C_T = 0.1\mu F$ and $\eta = 0.58$ find the frequency of oscillations.	Evaluate	6
	UNIT-IV **TRANSISTOR BIASING AND STABILIZATION** **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 thermistor 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 thermal stability	Remember	7
17	Draw the circuit diagram of a self-bias circuit of CE amplifier?	Analyze	8
18	Draw the circuit diagram of a emitter feedback bias circuit of CE amplifier?	Apply	8
	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	Remember	9

	'Thermal Runaway' in Bipolar Junction Transistors?		
6	Draw the circuit diagram & small signal equivalent of CB amplifier using accurate h-parameter model. Derive expressions for A_V, A_I, R_i and R_0?	Apply	9
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} and I_{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
12	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
13	A bipolar junction transistor with h_{ie} = 1000Ω, h_{fe} = 40, h_{re} = 2.6x10^{-4}, h_{oe} = 25 µA/V, is to drive a load of 500Ω in CB amplifier arrangement. Estimate A_V, A_I,?	Evaluate	9
14	Design a fixed bias circuit using silicon transistor, with the following specifications: V_{CC} = 12V, V_{BE} = 0.6V, V_{CEQ} =6V, I_{CQ} = 4 mA & β= 70?	Evaluate	10
15	Design a self-bias circuit using silicon transistor to achieve a stability factor of 10, with the following specifications: V_{CC} = 15V, V_{BE} = 0.7V, V_{CEQ} = 6V, I_{CQ} = 4 mA & β = 40?	Evaluate	10
	ANALYTICAL QUESTIONS		
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 h-parameter model. For the emitter follower circuit with R_S = 0.5KΩ and R_L = 5KΩ, 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= 150KΩ, R_c = 3KΩ, V_{cc} = 12V. Find the emitter, base and collector currents and also verify in which region the transistor operates. 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}= 2V, I_C = 4mA, h_{fe} = 80. Assume any other design parameters required. Draw the designed circuit.	Evaluate	10
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=1kΩ. The load impedance is RL=1KΩ. The transistor parameters are hib= 22, hfb= -0.98, hrb=2.9×10−4, hob= 0.5μA/V.	Analyze	9
12	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
13	A common Emitter circuit has the following, components. Rs=1kΩ, R1=110KΩ, R2=12KΩ, Rc=6KΩ, 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
14	The h-parameters of a transistor used in a CE circuit are hie = 1.0 KΩ, hre= 10×10−4, hfe = 50, hoe = 100K mho. The load resistance for the transistor is 1KΩ in the collector circuit. Determine Ri, Ro, AV & Ai in the amplifier stage (Assume Rs = 1000).	Evaluate	9
15	Determine AI, AV, RI, R0 of a transistor with hie =1.1KΩ, hfe=50, hre =205*10−4, hoe = 25μA/V is connected in CE configuration as shown in fig. 	Evaluate	9
	UNIT-V **Field Effect Transistor and FET Amplifiers** **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	Give the classifications of FETs and their Apply areas?	Remember	11
5	Define pinch off voltage?	Understand	11
6	Draw the structure of an n-channel JFET?	Remember	11
7	Define rd and gm?	Remember	11
8	Draw the static characteristics curves of an n-channel JFET?	Understand	12
9	Draw the drain characteristics of depletion type MOFET?	Remember	12
10	Draw the small signal model of JFET?	Remember	11
11	Draw the transfer characteristics for P-channel JFET?	Understand	12
12	Draw the Drain V-I characteristics for p-channel JFET?	Remember	12
13	Explain about ohmic and saturation regions?	Understand	12
14	Draw the drain characteristics of an n-channel enhancement type MOSFET?	Remember	12
	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 low 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	For an n-channel silicon FET, find the pinch-off voltage and the channel half-width. Assume a = 3 X 10^{-6} m, $N_D = 10^{21}$ electrons/m^2, $V_{GS} = 0.5V_p$, I_D = 0 and relative dielectric constant of silicon = 12.	Analyze	11
	ANALYTICAL QUESTIONS		
1	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
2	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= 5m mho and V_{DD} = 20 V. Determine A_V& R_O?	Evaluate	13
3	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
4	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
5	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
6	A Common Source FET amplifier circuit shown in Figure with un-bypassed R_S has the following circuit parameters: R_d = 15K, R_S = 0.5K, Rg = 1M, r_d = 5K, g_m= 5m mhos and V_{DD} = 20 V. Calculate A_V, A_I, R_i and R_0? 	Evaluate	13

7	For the circuit shown in fig. Determine i) Input impedance ii) output impedance and iii) voltage gain? 	Evaluate	13
8	In the common source FET amplifier shown in given Figure, 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
9	A self-biased n – 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	13
10	The P-channel FET has a $\|I_{DS\|}$ = -10mA, |Vp|=4V, V_{GS} is 2.4 V. **Determine** I_D, g_m and g_{mo}.	Evaluate	14
11	For common source amplifier operating point is defined by V_{GSQ} = -2.5V, V_p = -6V and I_{DQ} = 2.5mA with I_{dss} = 8mA. Calculate g_m, r_d, Z_i, Z_o and voltage gain A_v. Assume R_G = 1M ohms, R_s = 1K ohms, V_{dd} = + 15V and R_D= 2.2K ohms.	Evaluate	14
12	In an n-channel FET, the effective channel width is 5x 10^{-4}cm and the donor impurity concentration is 10^{16} electrons/cm^3. Find the pinch-off voltage?	Evaluate	13
13	A Common Source FET amplifier circuit with un bypassed R_S has the following circuit parameters: R_d = 10K, R_S = 1.5K, Rg = 1M, r_d = 4K, g_m= 5m A/V and V_{DD} = 15 V. Determine A_V& R_O?	Evaluate	13
14	For an n-channel JFET, V_p = -2.0V, g_{mo} = 1.60m A/V and I_{DSS} = 1.65mA, calculate I_D, g_m and V_{GS} for zero drift current.	Evaluate	14
15	For an n-channel JFET, V_p = -3.0V, g_{mo} = 1.40m A/V and I_{DSS} = 2.65mA, I_D = 0.8mA, calculate the value of g_m.	Evaluate	14

Prepared By: Mr. B. Naresh, Assistant Professor, Department of ECE

Date: 13th June, 2016

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