P.R. GOVERNMENT COLLEGE (A), KAKINADA
Electronics - Semester – II
Paper – 2 [Code: EL2202]
w.e.f. 2019-20ADMITTED BATCH

Electronic Devices and Circuits

4 Hours/Week [Total: 60 hrs.] **Credits: 3**

Course Learning Outcomes

The subject aims:

- ✓ Students will reliably demonstrate skills in solving problems concerning
- ✓ The capability to use abstractions to analyze and design BJT simple electronic circuits
- ✓ The capability to design and construct circuits, take measurements of circuit behavior and performance, compare with predicted circuit models and explain discrepancies.
- ✓ Describe the scientific principles that apply to the basic
- ✓ Understand the Photo Electric Devices.
- ✓ Analyze the SCR, FET, UJT.
- ✓ Provide hands-on opportunities for students to construct electronic circuits and build electronic projects of varying difficulty levels, ranging from simple to intermediate
- ✓ Cultivate and sustain students' interest in learning through circuit simulations and self-assessment activities
- ✓ Promote active learning through activities such as information search and presentations

Learning Outcomes:

Students will be able to:

- ➢ Recall construction, working, V-I characteristics of PN Junction Diode & Zener Diode.
- ➢ Observe Fixed bias and self bias arrangement
- ➢ Compare FET over BJT
- ➢ Explain UJT as a relaxation oscillator
- ➢ Demonstrate Solar Cell and LED
- ➢ Determination of h-parameters from the characteristics of BJT

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SYLLABUS

UNIT - 1: (12 Hrs)
P-N junction diodes:

P-N junction Diode, Depletion region, Barrier Potential, Working in Forward and Reverse bias condition – Junction capacitance, Diode current equation (no derivation)– Effect of temperature on reverse saturation current – construction, working, V-I characteristics and simple applications of Zener diode.

UNIT –II :(12 hrs)
Bipolar junction transistor and its biasing: (d.c)

Introduction, Transistor Construction, NPN and PNP transistors working, current components in BJT, Operation and characteristics of CB, CE, CC Configurations, Transistor as an amplifier.

BJT Biasing: Fixed-Bias Circuit, Collector to base bias and self bias, Bias Stabilization.

UNIT-III :(12hrs)
Field Effect Transistors & UJT:

Introduction, Construction, Operation and Characteristics of FET/JFET, Drain and Transfer characteristics, Depletion-type, and Enhancement-Type MOSFETs.

UJT: construction-working, V-I characteristics, UJT as a Relaxation oscillator.

UNIT - IV: (10hrs)
Photo electric devices:

Light-Emitting Diodes (LEDs), Photo diode, Photo transistors, Structure and operation of LDR.IR emitters

UNIT-V :(14hrs)
Rectifiers & Power supplies:

Rectifiers: Half wave, full wave and bridge rectifiers - Efficiency-ripple factor-Regulation (only) Types of filters - L-section & π-section filters.

Block diagram of regulated power supply, Three terminal fixed voltage I.C.regulators (78XX and &79XX).

Block diagram and working of SMPS (switch mode power supplies)

Reference Books:

1. Grob's Basic Electronics - Mitchel E.Schultz 10th Edn. Tata McGraw Hill (TMH)
2. Network lines and fields- Ryder- Prentice Hall of India (PHI)
3. Circuit analysis - P.Gnanasivam- Pearson Education
4. Circuits and Networks - A.Sudhaksr & Shyammohan S. Palli - TMH
5. Network Theory - Smarajit Ghosh - PHI
6. Electronic Devices and Circuits-Millman and Halkias - TMH
7. Electronic Devices and Circuits-Allen Mottershead - PHI
8. Principles of Electronics- V.K. Mehta and Rohit Mehta - S Chand &Co
9. Electronic Devices and Circuit Theory- R.L.Boylestad and L.Nashelsky- Pearson Education.
10. Pulse digital switching waveforms -Millman &Taub - TMH.
11. Applied Electronics- R.S.Sedha - S Chand &Co
12. A First course in Electronics- AA Khan & KK Day- PHI
13. Principles of Electronic circuits- Stanely G.Burns and Paul R. Bond- Galgotia.
14. Electronic Principles and Applications – A.B. Bhattacharya- New Central Book Agency Pvt.
15. Basic Electronics — D.C. Tayal
16. Basic Electronics — Grobb
17. Electrical Technology II — B.L. Thereja & A.K. Thereja
18. Electronics — Ryder
19. Hand book of Electronics — Gupta & Kumar
20. Unified Electronics Vol 1 & 2 — Arora

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Electronic Devices and Circuits

4 Hours/Week [Total: 60 hrs.] **2019-20** **Credits: 3**

MODEL QUESTION PAPER

Note: -Set the question paper as per the blue print given.

Time: $2\frac{1}{2}$ Hrs. Max.Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Chapter Name	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
P-N Junction	1	2		20
Bipolar Junction Transistor (BJT)	1	1	1	20
Field Effect Transistor & UJT	1	**1**	1	20
Photo Electric Devices	1	1		15
Rectifiers & Power supplies	1	1	1	20
Total Marks				95

Note: At least two problems should be answered.

Electronic Devices and Circuits
Paper – 2 Semester - 2

QUESTION BANK

ESSAY TYPE QUESTIONS

UNIT-I: P-N junction diodes

1. Explain P-N junction diode, its Depletion region and Barrier Potential also working in forward and Reverse bias condition.
2. Explain construction and working of V-I characteristics and simple applications of Zener diode.
3. What is junction capacitance? Explain diode current equation and effect of temperature on reverse saturation current.
4. Explain construction of band structure of a P-N junction diode.

UNIT-II: Bipolar junction transistor and its biasing: **(D.C)**

1. What is transistor? Explain the working of NPN and PNP transistors.
2. Explain in detail about the current components in BJT and the operation of BJT.
3. Explain in detail about the Operation and characteristics of CB and CE Configurations.
4. Explain about biasing in BJT and bias stabilizing.

UNIT-III: Field Effect Transistors & UJT

1. Explain the Construction, Operation and Characteristics of FET/JFET.
2. Explain Depletion-type, and Enhancement-Type MOSFETs and also draw their drain characteristics.
3. Explain construction and working of UJT and draw its V-I characteristics.
4. Explain how UJT works as a Relaxation oscillator.

UNIT-IV: Photo electric devices:

1. Explain the Structure and operation of LDR. IR emitters.
2. Explain the construction and working of Photo diode. Give some applications of Photo diode.
3. Explain the construction and working of Photo transistors. What are the advantages of Photo transistors?
4. What is LED? Give 2 examples of LED's, also explain their working.

UNIT-V: Rectifiers & Power supplies

1. What is Rectifier? Explain half wave, full wave and bridge rectifiers.
2. What if meant by filter? What are the types of filters and explain them.
3. Draw the Block diagram of regulated power supply and explain in detail.
4. Explain about three terminal fixed voltage I.C. regulators (78XX and &79XX).
5. Draw the Block diagram and explain the working of SMPS (switch mode power supplies).

SHORT ANSWER TYPE QUESTIONS

UNIT-I: P-N junction diodes

1. Explain the working of P-N junction diode in forward bias condition.
2. Explain the depletion region and barrier potential in P-N junction diode.
3. Explain the Effect of temperature on reverse saturation current.
4. Write the applications of Zener diode.
5. What is Junction capacitance, Diode current equation?

UNIT-II: Bipolar junction transistor and its biasing: (D.C)

1. Explain the transistor construction.
2. Explain the operation and construction of CE configuration.
3. Explain the operation and construction of CB configuration.
4. Explain the operation and construction of CC configuration.
5. Write in detail about how transistor works as an amplifier.
6. Explain types of biasing in transistor.

UNIT-III: Field Effect Transistors & UJT:

1. Explain the construction and operation of FET/JFET.
2. Draw the drain and transfer characteristics and explain them.
3. Explain about Depletion-type, and Enhancement-Type MOSFETs.
4. Draw the V-I characteristics of UJT and explain in detail.
5. How transistor works as a relaxation oscillator?

UNIT-IV: Photo electric devices:

1. What is LED? Explain about LED.
2. Explain the operation of LDR.
3. Explain abut photo diode and photo transistor.
4. Explain about IR emitters.

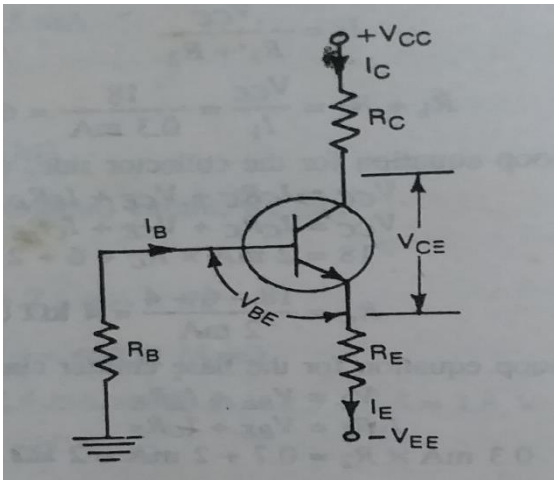
UNIT-V: Rectifiers & Power supplies

1. Draw and explain full wave rectifier.
2. Draw and explain bridge rectifier.
3. What is a filter? Explain L-section filter.
4. Draw the block diagram of regulated power supply.
5. Draw the block diagram of SMPS (switch mode power supplies).
6. Explain any one of Three terminal fixed voltage I.C. regulators (78XX and &79XX).

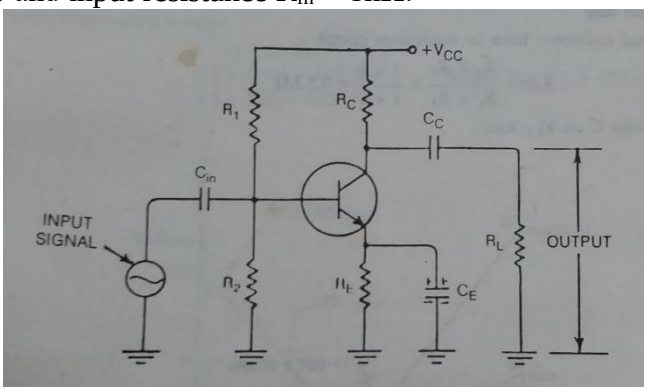
PROBLEMS:

UNIT-II: Bipolar junction transistor and its biasing: **(d.c)**

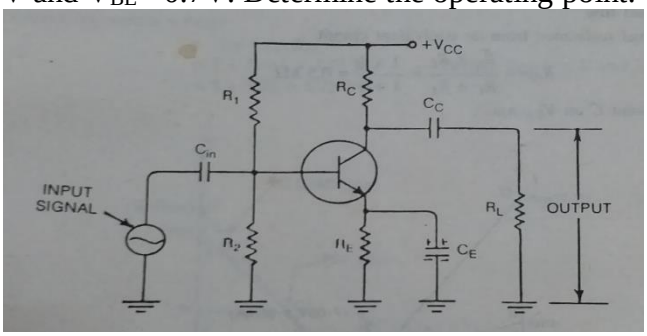
1. For the emitter biasing circuit shown in below fig, if R_c = 5.1kΩ, R_E = 100kΩ, R_B = 6.8kΩ and the split supply is +15v and -15v. Determine i) the operating point, ii) collector voltage V_c.



2. For the circuit shown in figure, if R_c = 6kΩ and R_L = 2kΩ. Determine the voltage gain. Assume that β = 50 and input resistance R_{in} = 1kΩ.



3. In a transistor amplifier when signal changes by 0.0012v, the base and collector current change by 10μA and 0.8mA respectively. If the collector load R_c = 4kΩ and R_L = 6kΩ. determine i) current gain ii) input impedance iii) ac load iv)Voltage gain v) power gain.
4. The circuit of a transistor amplifier is shown in fig, the value of different circuit components are R1= 8kΩ, R2 = 4kΩ, R_C=1kΩ, R_E = 2kΩ, R_L = 1kΩ. If the supply voltage V_{cc}=12V and V_{BE}= 0.7V. Determine the operating point.



UNIT-III: Field Effect Transistors & UJT:

1. When a reverse gate voltage of 20V is applied to a FET, the gate current is $1.6*10^{-3}\mu A$. determine the resistance between gate and source.
2. Determine the value of transconductance of a FET, when the drain current changes from 1mA to 1.9mA with a change in gate-source voltage from -3,3V to -3V.
3. Determine the transconductance of a FET if its amplification factor is 96 and drain resistance is 32kΩ.
4. A UJT has 10V between the bases. If the intrinsic standoff ratio is 0.6 find the value of standoff voltage. What will be the peak point voltage if the forward voltage drop in the pn junction is 0.7V?

UNIT-V: Rectifiers & Power supplies

1. A half-wave rectifier is used to supply 12V D.C. to a resistive load of 500Ω. If the crystal diode has a forward resistance of 25Ω, determine the value of A.C. voltage supplied to the circuit.
2. A half-wave rectifier is used to supply 6V D.C. to a resistive load of 250Ω. If the crystal diode has a forward resistance of 50Ω, determine the value of A.C. voltage supplied to the circuit.
3. A full-wave center tap rectifier uses two crystal diodes each having a forward resistance of 25Ω. The r.m.s value of secondary voltage fed between center tap to each end of secondary is 48V and the load resistance is 1k Ω. Find i) d.c. output voltage, ii) d.c. output power.
4. A full-wave center tap rectifier uses two crystal diodes each having a forward resistance of 25Ω. The r.m.s value of secondary voltage fed between center tap to each end of secondary is 48V and the load resistance is 1k Ω. Find i) rectifier efficiency ii) peak inverse voltage.