Self-learning Assignment for

Basic Electronics Engineering (BE01R00111)

B.E. Semester-I

Directorate of Technical Education, Gandhinagar, Gujarat

Government Engineering College, Bhuj

Certificate

This is to certify that Mr./Ms. _____ _____ Enrollment No. _____ of B.E. Semester I _____ Engineering of this Institute (GTU Code: 015) has satisfactorily completed the Self-learning Assignment work for the subject Basic Electronics Engineering (BE01R00111) for the academic year _____

Place: _____

Date: _____

Name and Sign of Faculty member

Head of the Department

Preface

Main motto of any Self-learning Assignment work is for enhancing required skills as well as creating ability amongst students to solve real time problem by developing relevant competencies in psychomotor domain. By keeping in view, GTU has designed competency focused outcome-based curriculum for engineering degree programs where sufficient weightage is given to Tutorial work. It shows importance of enhancement of skills amongst the students and it pays attention to utilize every second of time allotted for Tutorial amongst students, instructors and faculty members to achieve relevant outcomes by solving Tutorial. It is must for effective implementation of competency focused outcome-based curriculum that every theory is keenly designed to serve as a tool to develop and enhance relevant competency required by the various industry among every student. These psychomotor skills are very difficult to develop through traditional chalk and board content delivery method in the classroom. Accordingly, this tutorial will help the students in problem solving to prove concept and theory.

By using this Self-learning Assignment students can go through the relevant theory and procedure in advance before the actual examination which creates an interest and students can have basic idea prior to examination. This in turn enhances pre-determined outcomes amongst students. Each tutorial/ Assignment will begins with competency, industry relevant skills, course outcomes as well as practical outcomes (objectives).

Basic Electronics Engineering is the fundamental course which deals with basic of electronics circuits like a diode, BJT, MOSFET.

Self-learning Assignment – Course Outcome matrix

Course Outcomes (COs):

CO-1 : Understand semiconductor diodes and their applications.

CO-2 : Comprehend working, characteristics and biasing of BJT.

CO-3 : Analyze BJT circuits in small signal domain.

CO-4 : Understand working, characteristics and biasing of FET.

CO-5 : Understand usage of Special Purpose Diodes.

Sr. No.	Self-learning Assignment	CO 1	CO 2	CO 3	CO 4	CO 5
1.	Self-learning Assignment -1	√				
2.	Self-learning Assignment -2		√			
3.	Self-learning Assignment -3			√		
4.	Self-learning Assignment -4				√	
5.	Self-learning Assignment -5					√

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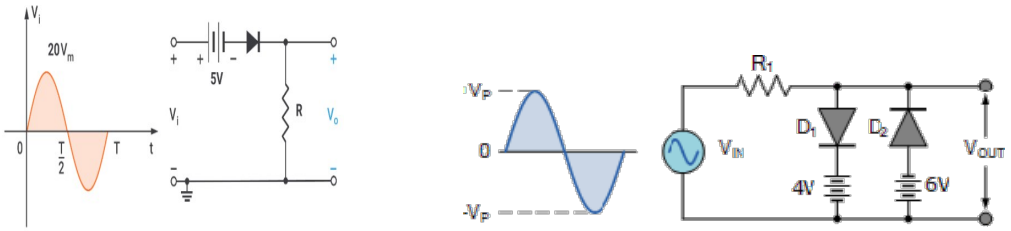
(Progressive Assessment Sheet)

Sr. No.	Objective(s) of Tutorial / Assignment	Page No.	Date of Start	Date of submission	Assessment Marks	Sign. of Teacher with date	Remarks
1.	Self-learning Assignment -1						
2.	Self-learning Assignment -2						
3.	Self-learning Assignment -3						
4.	Self-learning Assignment -4						
5.	Self-learning Assignment -5						

Self-learning Assignment -1

1. A silicon diode has a forward voltage drop of 0.7 V. Calculate the current through a series circuit with a 10 V source and a 1 kΩ resistor.
2. For a Zener diode with Vz = 5.1 V and load resistance 1 kΩ, calculate the minimum series resistor required for a 12 V input to ensure regulation.
3. A semiconductor diode has an internal resistance of 15 ohms. It is used as a half-wavw rectifier. Apply voltage is 50sin314t and load resistance is 700 ohms. Calculate: (i) I_m, I_{dc}, I_{rms} (ii) a.c. input power (iii) d.c. output power (iv) peak inverse voltage (v) efficiency of rectification.
4. An a.c. supply of 230V is applied to a full wave rectifier circuit through a transformer of a turn ratio 10:1. Determine (i) I_m, I_{dc}, I_{rms} (ii) a.c. input power (iii) d.c. output power (iv) peak inverse voltage (v) efficiency of rectification. Assume that the diode has forward resistance of 20 ohm and load resistance is 1kΩ.
5. Full wave rectifier has two identical diodes, the internal resistance of each is 20Ω. The transformer has ratio of 5:1 and has a centre tap. The primary voltage is 230V, 50Hz. The load resistance is 980Ω. Calculate (a) Average load current (b) r.m.s. value of current(c) d.c. output voltage (d) peak inverse voltage (e) efficiency of rectification.
6. Draw output of given circuit.



Insert the marks according to observations ;

Criteria	Level of Knowledge and Understanding	Quality & Correctness of Write-up and Submission	Total
Obtained Marks			

Self-learning Assignment -2

1) An NPN BJT has emitter current I_E = 5 mA and collector current I_C = 4.8 mA. Find base current I_B, current gain β and α.
2) In a silicon BJT, V_{BE} = 0.7 V. If base current is 2 mA, estimate percentage increase in I_C when V_{BE} increases to 0.75 V (V_T = 25 mV).
3) A transistor has β = 60 and base current pulse of 20 μA applied for 1 ms. Find maximum possible collector current and charge delivered to collector.
4) A fixed bias NPN transistor has V_{CC} = 12 V, R_C = 2 kΩ and I_C = 4 mA. Find V_{CE} if emitter is grounded.
5) In a voltage-divider bias circuit, V= = 15 V, R_1 = 150 kΩ, R_2 = 33 kΩ, R_C = 4.7 kΩ, R_E = 1 kΩ, β = 100. Find I_C and V_{CE}.
6) For an NPN transistor with β = 80, I_B = 50 μA, V_{CC} = 20 V, R_C = 3.9 kΩ, R_E = 1 kΩ, find I_E, I_C and V_{CE}.
7) A transistor has I_C = 2 mA, R_C = 5 kΩ, V_{CC} = 10 V. Find V_{CE} if emitter is grounded.
8) For NPN transistor, V_{BE} = 0.72 V, V_{BC} = -0.1 V. Identify transistor operating region.
9) For transistor with h_{fe} = 100, source resistance 10 kΩ, bias resistance 50 kΩ, estimate base current reduction due to source loading.
10) A CC amplifier (emitter follower) with β = 80 and R_L = 2 kΩ. If input changes by 1 V peak, estimate output amplitude and voltage gain.

Insert the marks according to observations ;

Criteria	Level of Knowledge and Understanding	Quality & Correctness of Write-up and Submission	Total
Obtained Marks			

Self-learning Assignment -3

1) A CE amplifier uses coupling capacitor CC = 10 µF connected to input resistance 50 kΩ. Find the lower cutoff frequency due to this capacitor.
2) In an amplifier circuit, bypass capacitor CE = 100 µF and emitter resistance R_E = 1 kΩ. Determine cutoff frequency below which gain reduces (use $f_L = 1 / (2\pi RECE)$).
3) A transistor amplifier has V_{CC} = 10 V, R_C = 2 kΩ, R_L = 5 kΩ. Find AC load line slope and end points.
4) For a transistor with I_C = 2 mA, find gm and re' if β = 100.
5) A CE amplifier has R_C = 4.7 kΩ, re' = 25 Ω, β = 120. Compute small-signal voltage gain
6) For CE amplifier with R_C = 3.3 kΩ, R_E = 1 kΩ, β = 100, re' = 25 Ω, compute voltage gain with emitter resistor unbypassed.

Insert the marks according to observations ;

Criteria	Level of Knowledge and Understanding	Quality & Correctness of Write-up and Submission	Total
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Self-learning Assignment -4

1) A JFET has I_{DSS} = 12 mA and V_p = -4 V. Calculate the drain current for V_{GS} = -2 V using Shockley's equation.
2) For a JFET, I_{DSS} = 10 mA, V_p = -5 V. Find V_{GS} when I_D = 6 mA.
3) Sketch and calculate values for transfer and output characteristics of a JFET with I_{DSS} = 8 mA and V_p = -3 V.
4) For given V_{GS} = -1.5 V, find I_D and gm using Shockley's equation. I_{DSS} = 10 mA, V_p = -4 V.
5) An n-channel enhancement MOSFET has kn = 2 mA/V² and V_{th} = 2 V. Find I_D for V_{GS} = 5 V.
6) For a MOSFET with V_{th} = 3 V, kn = 1.5 mA/V², calculate I_D for V_{GS} = 6 V.
7) A JFET amplifier has V_{DD} = 15 V, R_D = 3.3 kΩ, and R_S = 1 kΩ. Find the DC load line and Q-point if I_{DQ} = 3 mA.
8) In a gate bias circuit with V_{DD} = 15 V, R_D = 3.3 kΩ, R_G = 10 MΩ, and I_{DSS} = 12 mA, V_p = -4 V, find V_{GSQ}.
9) A self-bias JFET circuit has V_{DD} = 18 V, R_D = 2.2 kΩ, R_S = 1.5 kΩ, I_{DSS} = 10 mA, Vp = -4 V. Determine Q-point.
10) For a voltage divider bias circuit, R_1 = 1 MΩ, R_2 = 330 kΩ, R_D = 3.3 kΩ, R_S = 1 kΩ, V_{DD} = 15 V, find gate voltage VG and operating point.

Insert the marks according to observations ;

Criteria	Level of Knowledge and Understanding	Quality & Correctness of Write-up and Submission	Total
Obtained Marks			

Self-learning Assignment -5

1) An LED has a forward voltage of 2 V and is connected to a 5 V supply through a resistor. Find the required series resistor for 20 mA current, Determine power dissipated by LED.
2) A photo diode generates a photo current of 30 μA at an illumination of 0.3 mW/cm². Find responsivity (A/W).
3) A solar cell has open-circuit voltage Voc = 0.6 V, short-circuit current Isc = 100 mA, and fill factor FF = 0.75. Find maximum power output.
4) A solar cell gives 4.5 V and 300 mA in full sunlight. Find total power and current for 6 cells connected in series-parallel (2s × 3p).
5) For a seven-segment display, each segment draws 15 mA at 2 V. Find total current for displaying digit '8'.

Insert the marks according to observations;

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