

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2021****Subject Code:3172413****Date:13/12/2021****Subject Name:Advanced Power Electronics Devices and Interface Circuits****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

| | | MARKS |
|------------|---|-----------|
| Q.1 | (a) State the advantages and applications of WBG devices. | 03 |
| | (b) Compare SiC devices with Si devices. | 04 |
| | (c) Write a note on Wide Band Gap devices. | 07 |
| Q.2 | (a) Draw the pin diagram of IR2110 and explain briefly its pins. | 03 |
| | (b) Explain why isolated driver is required in power electronics. | 04 |
| | (c) Suggest IC based driver circuit with short circuit protection for half bridge and explain working of the same. | 07 |
| OR | | |
| | (c) Draw the schematic of relay driver ULN 2803 for driving a motor load using a microcontroller. Explain its working. | 07 |
| Q.3 | (a) Explain the use and importance of differential voltage probes. | 03 |
| | (b) Write a note on galvanic isolation. | 04 |
| | (c) Explain the construction and working of hall effect sensors. | 07 |
| OR | | |
| Q.3 | (a) Explain in brief the use of logic analyzer. | 03 |
| | (b) Write a note on isolation amplifier. | 04 |
| | (c) Draw schematic and explain voltage measurement using Op-Amp. Also explain how will you interface the output of the Op-Amp with a microcontroller. | 07 |
| Q.4 | (a) Which type of core is required for high frequency switching applications. State different types of cores used in practice. | 03 |
| | (b) Explain F to V conversion using LM331. | 04 |
| | (c) State and explain the steps for transformer design of forward converter. | 07 |
| OR | | |
| Q.4 | (a) Explain the consequence of a transformer getting saturated | 03 |
| | (b) Discuss the reason of keeping airgap in high frequency inductors. | 04 |
| | (c) Design a high frequency transformer for a forward converter having the following specifications: $V_o = 12V, V_{in} = 24V \pm 10\%, I_o = 4A, V_{out_ripple} = 1\% \text{ of } V_o, f_{sw} = 20kHz, J = 3 A/mm^2, B_m = 0.2T$. Assume no drop across diode and inductor. | 07 |
| Q.5 | (a) Explain briefly, floating ground in power converters. | 03 |
| | (b) State the requirement and importance of cooling in semiconductors. | 04 |
| | (c) Write a note on thermal resistance. | 07 |
| OR | | |
| Q.5 | (a) Explain briefly, common mode signals in power electronics circuits. | 03 |
| | (b) Discuss steps of heat sink design and calculation for a given power switch. | 04 |
| | (c) Write a note on cooling methods. | 07 |
