Reg. No.



## MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

(A constituent Institution of MAHE, Manipal)

## **II SEMESTER M.TECH (POWER ELECTRONICS & DRIVES)**

## **END SEMESTER EXAMINATIONS, APRIL 2018**

## SUBJECT: ADVANCED POWER ELECTRONIC CONVERTERS [ELE 5222]

REVISED CREDIT SYSTEM

| Time: 3 Hours Date: 27 April 2018 |  | Max. Marks: 50   |                                       |      |
|-----------------------------------|--|--|---------------------------------------|------|
| Instructions to Candidates:       |  |  |                                       |      |
|                                   | <ul> <li>Answer ALL the questions.</li> </ul>  |  |                                       |      |
|                                   | <ul> <li>Missing data may be suitably a</li> </ul>   | assumed.   |                                       |      |
| 1A.                               | Design a boost converter with i<br>resistance is $4\Omega$ ; switching frequ<br>as 1% of their respective averag | input voltage being 12V; output voltage is<br>iency of 20kHz. Assume the current and vol<br>ge values.                             | s 20V; load<br>tage ripple            | (02) |
| 1B.                               | If a cuk converter is used to mee<br>respect to boost converter desig  | et the specifications of Q1A, design and eva<br>med in Q1A.  | aluate with                           | (08) |
| 2A.                               | Explain the procedure for design   | ning an inductor.  |                                       | (05) |
| 2B.                               | Show that a buck-boost conve<br>expressions for K and $K_{crit}$ . Deriv   | rter operates in DCM when K <k<sub>crit and<br/><i>v</i>e the expression of converter voltage gain</k<sub>                         | derive the                            | (05) |
| 3A.                               | A Flyback converter is fed with<br>10W resistive load. Draw the wa<br>current and the current and volt           | an input voltage of 12V. The converter d<br>aveforms of load voltage, magnetizing curre<br>tage across MOSFET/s.                   | rives a 5V,<br>ent , source           | (05) |
| 3B.                               | An Isolated Full Bridge DC-DC<br>converter drives a 5V, 10W re<br>magnetizing current, source cur                | converter is fed with an input voltage o<br>esistive load. Draw the waveforms of loa<br>rrent and the current and voltage across M | f 12V. The<br>ad voltage,<br>OSFET/s. | (05) |
| 4A.                               | Represent the buck converter by averaging technique.   | v its small signal equivalent circuit model u  | sing circuit                          | (03) |
| 4B.                               | If the Peak Current Mode Contr<br>buck converter of Q4A, modify t<br>peak current mode control.                  | rol, with slope compensation, is implement<br>the equivalent circuit diagram of buck conv  | nted in the<br>verter with            | (07) |
| 5A.                               | Explain the motivation for the a   | pplication of soft switching.  |                                       | (02) |
| 5B.                               | With the circuit diagrams and re<br>ZCS L-Type Buck Converter. Der<br>and the resonant capacitor volta           | elevant waveforms explain the working of a<br>rive the expressions of the resonant induct<br>age.                                  | a Resonant<br>tor current             | (08) |