MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
PROCTORED ONLINE MAKEUP EXAMINATIONS, FEBRAUARY 2022

MODERN POWER CONVERTER [ELE-4085]

REVISED CREDIT SYSTEM

Time: 75 Minutes + 10 Minutes **Date: 17 FEBRUARY 2022** **Max. Marks: 20**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Time: 75 minutes for writing + 10 minutes for uploading.

1A. What are the drawbacks of Hard switching? Explain the possible solutions ***(02)***

1B. In a step up converter the duety ratio is adjusted to regulate the output voltage Vo= 48V. The input voltage varies in a wide range from 18 to 42V. The maximum power output is 150W. For stability reasons, it is required that the converter always operate in a discontinuous current conduction mode. The switching frequency is 50kHz. Assuming ideal components and C as very large. Calculate the maximum value of L. ***(04)***

1C. A Forward converter has the following parameters source voltage is 200V , N1/N2=N1/n3=1, Magnetizing inductance is 1mH, Lx=70μH, load resistance is 50Ω, C=66μF and D= 0.4. The switching frequency is 300kHz. Estimate (a) Output Voltage (b) peak current in Lm in the transformer model. And output ripple. ***(04)***

2A. Analyze the waveforms for current through Lr and the voltage across the capacitor of a zero voltage switched buck converter. Also, mark the various time instants. ***(02)***

2B. A parallel resonant half bridge dc-dc converter is supplying a resistive load of 10 Ω from a source voltage of 100 V. The switching frequency is 20% excess of the resonant frequency of 100 kHz, and characteristic impedance Z_o = 5 Ω. Calculate suitable values of L_r and C_r for the converter and hence determine the output voltage. ***(04)***

2C. The averaged small signal ac model of a boost converter is shown in Fig.Q 2C. Develop the canonical circuit model of the same. Given: $v_1 = \hat{v}_g(t)$; $v_2 = V\hat{d}(t)$; $N_1 = D'$; $N_2 = 1$; $i = \frac{V}{RD'}\hat{d}(t)$; $v_3 = \hat{v}(t)$ ***(04)***

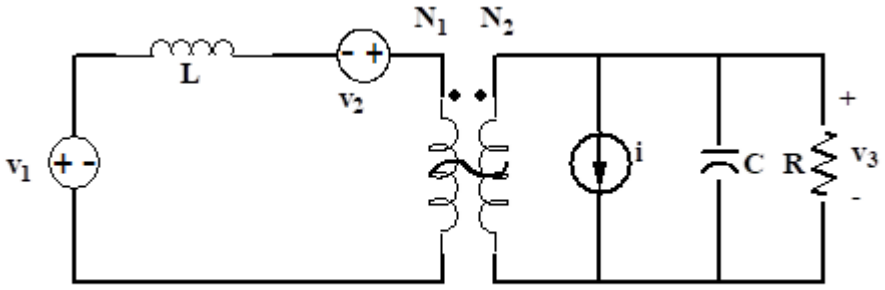

Fig.Q No.2C