

JYOTHI ENGINEERING COLLEGE
Cheruthuruthy, Thrissur
Ph.D. Comprehensive Examination, May 2023



Answer ALL questions

Module III (Biomedical signal processing)

1. Discuss in detail about Computer-Aided diagnosis? (6)
2. Design a frequency domain filter to remove periodic artifacts such as power line interference? (9)
3. Develop signal processing techniques to facilitate detection of the QRS complex, given that it is the sharpest wave in an ECG cycle? (10)

Module IV (Topics from Research)

4. Identify the technologies used for power supplies of implantable devices and analyze the dielectric properties of various tissues in human body (7)

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Max. Marks: 100

Duration: 3 Hrs.

Answer ALL questions

Module I (Analysis of Power Electronic Circuits I)

1. A buck converter is supplied with power from an ideal battery of 100V. the load voltage waveform consists of rectangular pulses of duration 1 ms in an overall cycle time of 2.5 ms. Calculate for a resistive load of 10Ω
 - i) The duty cycle
 - ii) The average value of output voltage
 - iii) The ripple factor
 - iv) The output DC power
 - v) The RMS value of output voltage

(9)
2. A single-phase half bridge inverter has a resistive load of $R=2.5\Omega$ and the dc input voltage is $V_s=50V$. Determine
 - a) the rms output voltage at the fundamental frequency V_{o1} ,
 - b) the output power P_o
 - c) the average and peak currents of each transistor
 - d) the peak reverse blocking voltage of each transistor.

(9)
3. Explain a three-phase bridge inverter for 180-degree mode of operation with relevant phase and line voltage wave forms.

(7)

Module II (Design of Power Electronic Circuits)

4. How can we minimize the stray inductance in drive circuits? Explain

(7)
5. Find $R_{\theta,rad}$ for a cube of black oxidized aluminum 10 cm on a side. Assume $T_s=120^\circ C$ and $T_a=20^\circ C$.

(5)
6. A thin plate has a surface temperature of $120^\circ C$ when the surrounding air temperature is $20^\circ C$. The plate is 10cm high (vertical dimension) and 30 cm wide. Find $R_{\theta,conv}$

(5)
7. With neat circuit diagram explain single phase full bridge inverter and PWM with bipolar voltage switching scheme

(8)

Module IV (Topics from Research)

8. What is the need for wireless electric vehicles and analyze the coil design issues in inductive static charging system (9)
9. Briefly explain a four-plate capacitive coupler design and LCL-compensated topology for capacitive power transfer for electric vehicle charging (9)
