Answer all twenty questions.

Name: **Student Number:**

1. For what do the letters MOSFET stand?

2. Sketch the electrical symbol of the n-channel IGBT?

3. Why do we model the pole current as being constant during the switching transitions?

4. List three of the four semiconductor switches principally used in switch-mode power electronics?

5. What are the three terminals of a MOSFET?

6. Why does the MOSFET on resistance increase with temperature?

7. What is the lightly-doped n- region more commonly known as in a n-channel MOSFET?

8. In terms of n, n+, n-, p, p+, p-, what are the five layers of the IGBT going from emitter to collector?

9. What is the purpose of the source-body metallization of the power MOSFET?

10. What two device characteristics make the IGBT a more preferable device to the MOSFET for high-voltage operation?

Answer all twenty questions.

11. A MOSFET operates in a boost converter with a 300 Vdc bus, and experiences an additional 75 V voltage spike? Using typical derating guidelines, what voltage silicon would you recommend, to the nearest 100 volts?

12. A device has a MTBF of 100,000 hours, what is the failure rate, λ, per million hours?

13. If the turn-on energy loss equals the energy turn-off loss equals 0.1 mJ, what is the power dissipation in the device due to switching losses when the device is switching at 10 kHz?

14. Give two reasons why the reverse recovery of power diode is undesireable?

15. In addition to capacitors, which device models the MOSFET in the active region?

16. What is the undesireable characteristic of the IGBT at turn off known as?

17. Which component of the MOSFET typically determines the maximum gate-source breakdown voltage?

18. Which layer of the MOSFET typically determines the on-resistance?

19. What are the three operating regions of the MOSFET?

20. What is the principal difference in fabrication of a power MOSFET and IGBT?