BANKURA UNIVERSITY

B.Sc. 5th Semester (Honours) Examination, March 2021

Subject: *Electronics (H)*

Course ID: 51716 Course Code: SH/ELC/503/DSE-1(TH)

Course Title: *Power Electronics*

Full Marks: 25 Time: 1 Hr 15 Min

(The figures in the right hand side margin indicate marks.
Answer all the questions)

1. Answer *any three* of the following questions: 1×3=3
   a) What do you mean by "rating" of an SCR?
   b) Power BJT is a current controlled device. Why?
   c) What is meant by forced commutation?
   d) What is meant by duty-cycle?
   e) What is the main drawback of a single phase half bridge inverter?
   f) What are the two configuration of single phase 2 pulse controlled rectifier?

2. Answer *any three* of the following questions: 2×3=6
   a) Explain the terms $\frac{dv}{dt}$rating and $\frac{di}{dt}$rating of an SCR.
   b) Mention two drawbacks of GTO?
   c) Why circuit turn off time should be greater than the thyristor turn-off time?
   d) What is meant by inverter? What are the applications of an inverter? 1+1
   e) Give the full form of the following: IGBT, PUT, RCT, SCS.
   f) What is meant by inversion mode in single phase fully controlled converter?

3. Answer *any two* of the following questions: 5×2=10
   a) Explain different modes of operation of thyristor with the help of static V-I characteristics.
   b) What is a power transistor? With a neat sketch, explain its basic structure. Draw its I-V characteristics. What is second breakdown? 1+2+1+1
   c) With a neat circuit diagram, explain the principle of operation of a 1-φ half bridge inverter and derive an expression for the rms value of fundamental component of load voltage. 1+2+2
   d) How do you protect the thyristors from over voltages and over currents? Explain the various protection schemes used. 2.5+2.5

4. Answer *any one* of the following questions: 6×1=6
   a) Explain the operation of step down chopper with a neat circuit diagram and necessary waveforms. Also derive expression for output voltage. 4+2
   b) If a purely resistive load is supplied through single phase half wave controlled converter and $\alpha=\frac{\pi}{2}$, determine (i) Form factor, (ii) Rectification efficiency, and (iii) Ripple factor. 2+2+2
   c) Explain the operation of single phase fully controlled bridge converter with R load. Obtain the expressions for average and rms value of output voltage with relevant waveform. 2+2+2