

- N. B.: (1) Question No. 1 is compulsory.
(2) Attempt any **THREE** questions from the remaining five questions.
(3) Assume suitable data if necessary.
(4) Figures to the right indicate full marks.

1. Attempt any four questions:

- (a) Explain regenerative braking of DC motor. 20
(b) What are the advantages and disadvantages of SMPS.
(c) Explain the advantages of induction heating.
(d) Compare SVM with the conventional sine wave PWM.
(e) Give the significance of slip in AC motors.
2. (a) Explain in detail the principle and working of simple buck boost 10
converter with the help of necessary derivation and waveforms.
(b) Derive and explain the average state space model of buck converter. 10
Use this state space model to derive equation for output voltage of buck
converter at equilibrium condition ($dv/dt = 0$).
3. (a) Derive an expression for overlap angle (μ) and output voltage for a 10
single-phase fully controlled bridge rectifier with source inductance.
(b) Explain PWM as used for inverters. What are its advantages? 10
4. (a) Explain the three regions in the torque-slip characteristics of an 10
induction motor. Which is the most stable region of operation in the
torque-slip characteristics? Justify your answer with suitable figure.
(b) Explain various method of speed control for 3-phase induction motor. 10
5. (a) Give different methods of controlling speed of separately excited DC 10
motor. Explain constant torque and constant power operation.

[TURN OVER]

5. (b) A 220V, 1300 rpm, 8A separately excited DC motor has armature resistance of 1 ohm. It is fed from a single-phase fully controlled bridge rectifier with an AC source voltage of 230 volts, 50Hz. Assuming continuous load, compute Motor speed at firing angle of 45 degrees and torque of 5 NM. 10

6. Write short notes on (any three) 20

- (a) Battery charging system.
- (b) Kramer's drive.
- (c) Classification of UPS.
- (d) Harmonic reduction in inverters.