

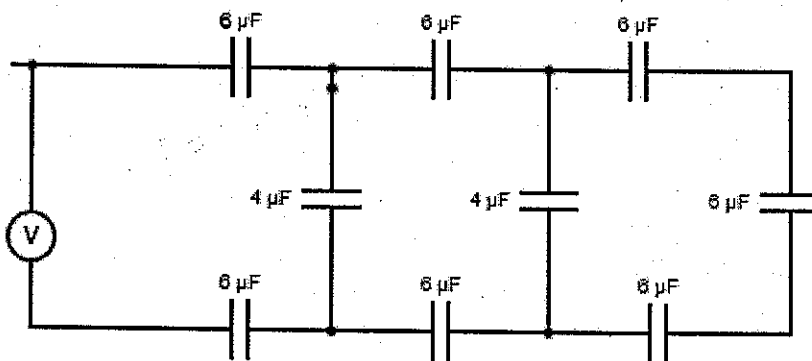
B.E. PRINTING ENGINEERING FIRST YEAR SECOND SEMESTER (Old) - 2019Subject : **ELECTRICAL TECHNOLOGY**

Time : 3 hrs

Full Marks : 100

Instruction : Answer any five questions.

1. (a) Derive the average and RMS values of a sinusoidal voltage waveform. 3 + 3
 (b) Find the equivalent capacitance of the following circuit – 5



- (c) Define Form Factor. 2
 (d) A current wave is represented by $I = 10 \sin 377t$. Find the (i) frequency, (ii) time period, (iii) maximum value, (iv) RMS value, (v) instantaneous value at, $t = 0.05$. 7
2. (a) Briefly describe the voltage build-up in self-excited dc generators. 5
 (b) Deduce the emf equation of dc machine. 5
 (c) A 4-pole, 250 V dc long-shunt compound generator supplies a load of 10 kW at the rated voltage. The armature, series field and shunt field resistances are 0.1Ω , 0.15Ω and 250Ω respectively. The armature is lap wound with 50 slots, each slot containing 6 conductors. If the flux per pole is 50 mWb, calculate the speed of the generator. 10
3. (a) A 220 V, DC series motor is running at a speed of 800 rpm and draws 100 A. Calculate at what speed the motor will run when developing half the torque. Total resistance of the armature and field is 0.1Ω . 10
 (b) Draw the connection diagrams of different types of self-excited dc motors along with their corresponding voltage equations. 10

4. (a) Deduce the equivalent circuit of a transformer. 7
- (b) A transformer has 500 turns of the primary winding and 10 turns of the secondary winding. (i) Determine the secondary voltage if the secondary circuit is open and the primary voltage is 120 V. (ii) Determine the current in the primary and secondary winding, given that the secondary winding is connected to a resistance load of 15Ω ? 10
- (c) What is eddy current loss? How can you reduce the eddy current loss in transformer core? 3
5. (a) State the merits and demerits of squirrel cage induction motor and slip ring induction motor. 4 + 4
- (b) A 3-phase, 460 V, 60 Hz, 4 pole induction motor delivers rated power output at a slip of 0.05. Determine the (i) synchronous speed; (ii) motor speed, (iii) frequency of the rotor circuit, (iv) slip speed. 10
- (c) What are measures taken to avoid the magnetic locking of rotor and stator teeth of induction motor? 2
6. (a) Briefly explain the necessity of a starter to start a dc motor. 4
- (b) How does the rotor of an induction motor rotates? 6
- (c) Define the functions of commutator and brush. Also state the name of the materials that are used in commutator and brush. 4 + 2
- (d) What is the transformation ratio of a transformer? 2
- (e) What is slip? 2
7. Write short notes on the following topics – (any two) 10 x 2 = 20
- (a) Measurement of 3-phase power using 2-wattmeter method.
- (b) Working principle of dc machine.
- (c) Phasor diagram of a transformer with inductive load.