

**B.Tech. - VIEP - ELECTRICAL ENGINEERING
(BTELVI)**

Term-End Examination

00743

June, 2018

BIEE-004 : ELECTRICAL MACHINES - I

Time : 3 hours

Maximum Marks : 70

Note : Answer any *five* questions. All questions carry equal marks. Use of scientific calculator is allowed.

1. (a) Derive an expression for computing the per unit voltage regulation of transformer, both for lagging and leading power factor. 8
- (b) Describe briefly, various losses in the transformer and explain how each loss varies with load current. 6
2. (a) A 20 kVA, 2500/250 V, 50 Hz single-phase transformer gave the following test results :
O.C. (L.V side) : 250 V, 1.4 A, 105 W
S.C. (H.V side) : 104 V, 8 A, 320 W
Compute the parameters of the approximate equivalent circuit referred to high voltage and low voltage side. Also draw the exact equivalent circuit referred to the low voltage side. 8

- (b) Explain the various three-phase transformer connections : $2 \times 3 = 6$
- (i) Star-Delta (Y- Δ)
- (ii) Delta-Star (Δ -Y)
3. (a) Explain the various methods of speed control for DC motor : $2 \times 4 = 8$
- (i) Field control
- (ii) Armature control
- (b) What is compensating winding ? Explain the methods of improving commutation in DC machines. 6
4. (a) Draw and explain torque-current characteristics of DC shunt, series and cumulative compound motors. 8
- (b) Describe the application of DC shunt, series and cumulative compound motors. 6
5. (a) A series motor, with an unsaturated magnetic circuit and 0.5Ω total resistance, when running at a certain speed takes 60 A at 500 V. If the load torque varies as the cube of the speed, calculate the resistance required to reduce the speed by 25%. 7
- (b) Derive the torque equation of a DC motor. 7
6. (a) What is meant by Armature Reaction ? 4
- (b) Show that the effect of armature m.m.f on the main field is entirely cross magnetising. 6

- (c) Under saturated conditions, the effect of armature m.m.f is to demagnetise the main field. Explain this with the help of developed view of armature conductor and poles. 4
7. (a) A 10 kVA, 2500/250, single-phase two winding transformer is used as an auto transformer to raise the supply voltage of 2500 V to an output voltage of 2625 V. The L.V. winding of the two winding transformer consists of two equal parts of 125 V each. If both parts of the low voltage winding are used, determine 10
- (i) Auto transformer kVA output.
- (ii) kVA transformed and conducted.
- (b) Discuss the points of similarity in transformers and rotating electrical machines. 4
8. (a) Why is a starter necessary for a DC motor ? Describe 4-point starter for DC machine. 8
- (b) Describe the emf equation for a DC generator. 6