

B.TECH/EE/4TH SEM /ELEC 2201/2016

- (vii) The maximum speed at which the field of a turbo alternator can be operated to develop 60 Hz is
 (a) 2600 rpm (b) 1600 rpm
 (c) 3600 rpm (d) 2800 rpm.
- (viii) The waveform of armature mmf in dc machine is
 (a) square (b) rectangular
 (c) triangular (d) sinusoidal.
- (ix) A DC series motor is never switched on without load connected at rated voltage source because
 (a) the field current is initially zero
 (b) the motor does not accelerate
 (c) the speed becomes dangerously high
 (d) none of these.
- (x) Tertiary winding is used in transformer connected in
 (a) Delta/Delta (b) Delta/Star
 (c) Star/Star (d) Star/Zig-Zig.

Group - B

2. (a) What are the advantages of distributing the windings in slots?
 (b) Derive an expression for the distribution factor for the fundamental frequency component.
 (c) For a three-phase uniformly distributed winding with coil span of 150° , determine the distribution and winding factors in case the winding has a phase spread of 120° .
3 + 5 + 4 = 12
3. Find out the expressions for electric field energy stored and co-energy for singly excited electric field system.
(8 + 4) = 12

Group - C

4. (a) A dc shunt motor, with an armature circuit resistance of 0.2Ω , operates a lift whose efficiency is 75%. Calculate power rating of the dc motor for raising a load of 750 kgs at a speed of 3m/sec. If the supply voltage falls from its initial value of 230 V to 200 V, calculate the lift speed.

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- (b) What is meant by constant power drive and constant torque drive? Explain how a dc motor can be adopted for these types of drives.
(3+3) + (2+2+2) = 12
5. A 300 V d.c shunt motor takes 6A at no-load. Its armature resistance (including brushes) is 0.5Ω and shunt field resistance is 150Ω . Estimate the kW output and efficiency when the motor takes 40A on full load. Find also the percentage change in speed from no-load to full- load.
(4 + 4 + 4) = 12

Group - D

6. (a) A 150 kVA transformer having 1.1% resistance and 4% leakage reactance is operated in parallel with 300 kVA transformer having 1.5% resistance and 5.5% leakage reactance. If the total load delivered is 450 kVA at unity p.f., calculate the kVA load on each transformer as well as operating power factor.
 (b) Why does the short circuit test give ohmic losses without being involved with the core losses?
 (c) A transformer has a maximum efficiency of 98% at $\frac{3}{4}$ th of its full load at unity power factor. The iron losses equal 314 W. compute the half load efficiency at 0.75 p.f. lagging.
4 + 3 + 5 = 12
7. (a) Show how in an auto transformer having same kVA and voltage rating, conductor material is saved, as compared to two winding transformer.
 (b) Define voltage regulation.
 (c) Explain the conditions which must be fulfilled for satisfactory parallel operation of two or more single-phase transformers.
 (d) The short circuit tests on two single-phase transformers gave the following results:
 250 kVA : 3.5% rated voltage; rated current at 0.25 p.f. lag
 400 kVA : 5% rated voltage; rated current at 0.3 p.f. lag.
 The two transformers are connected in parallel. How do they share a load of 600 kVA.
3 + 2 + 3 + 4 = 12

8. (a) What are the functions of the tertiary winding in a three phase transformer?
(b) Draw the phasor diagram and connection diagram of Dy1 and Yz11.
(c) Two Scott-connected transformers are used for transforming 6600 V, 3-phase to 400 V, 2-phase. The load on the main transformer secondary 400 kVA at unity p.f. and the load on the other secondary is 350 kVA at 0.8 p.f. lagging. Neglecting losses, compute the current in 3-phase line. Draw the corresponding phasor diagram.
3 + 4 + 5 = 12
9. (a) Explain how exciting current of a single phase transformer contains harmonics even when the supply voltage is a sine wave.
(b) Draw the phasor diagram and connection diagram of double-delta.
(c) Explain what is meant by oscillating neutral in Yy connected banks of single phase transformers. What methods can be employed to stabilize the neutral with such connection?
4 + 4 + 4 = 12

ELECTRICAL MACHINE - I
(ELEC 2201)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group - A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following: **10 x 1 = 10**
- (i) The current drawn by a 230V dc motor of armature resistance 0.5Ω and back emf 200 V is:
(a) 60 A (b) 40 A (c) 600 A (d) 660 A.
- (ii) The synchronous speed of a 6-pole 3-phase induction motor fed from 50 Hz supply is
(a) 1000 rpm (b) 1500rpm
(c) 750 rpm (d) 800 rpm
- (iii) Autotransformer makes effective saving on copper and copper losses, when its transformation ratio is
(a) approximately equal to one (b) less than one
(c) greater than one (d) one of the above.
- (iv) The utilization factor for transformers in open-delta is
(a) 0.75 (b) 0.667 (c) 0.866 (d) 0.5.
- (v) In an oil filled transformer, oil is provided for
(a) cooling (b) insulation
(c) lubrication (d) both cooling and lubrication.
- (vi) A transformer has negative voltage regulation when its load factor is
(a) zero (b) unity (c) leading (d) lagging.