

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/ Backlog), Nov.-Dec. 2015

B. Tech in Electrical Engineering, Semester III

Roll No.....

COURSE CODE: EE302

Time: 3 hours

Max. Marks: 100

COURSE TITLE: Electrical Machine-I

Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. In case of a 4-pole D.C. generator provided with a two layer lap winding with sixteen coils, the pole pitch will be
(a) 4 (b) 8 (c) 16 (d) 32
- ii. The function of pole shoes in the case of D.C. machine is
(a) to reduce the reluctance of the magnetic path
(b) to spread out the flux to achieve uniform flux density
(c) to support the field coil
(d) to discharge all the above functions
- iii. The speed of a D.C. shunt motor more than its full-load speed can be obtained by
(a) decreasing the field current (b) increasing the field current
(c) decreasing the armature current (d) increasing the armature current
- iv. Compensating windings are used in D.C. generators
(a) mainly to reduce the eddy currents by providing local short-circuits
(b) to provide path for the circulation of cooling air
(c) to neutralize the cross-magnetizing effect of the armature reaction
(d) none of the above
- v. As there is no back e.m.f. at the instant of starting a D.C. motor, in order to prevent a heavy current from flowing through the armature circuit
(a) a resistance is connected in series with armature
(b) a resistance is connected parallel to the armature
(c) armature is temporarily open circuited
(d) a high value resistor is connected across the field winding
- vi. Satisfactory commutation of D.C. machines requires
(a) brushes should be of proper grade and size
(b) brushes should smoothly run in the holders
(c) smooth, concentric commutator properly undercut
(d) all of the above

- vii. For the parallel operation of single phase transformers it is necessary that they should have
 (a) same efficiency (b) same polarity
 (c) same kVA rating (d) same number of turns on the secondary side
- viii. A transformer cannot raise or lower the voltage of a D.C. supply because
 (a) there is no need to change the D.C. voltage
 (b) a D.C. circuit has more losses
 (c) Faraday's laws of electromagnetic induction are not valid since the rate of change of flux is zero
 (d) none of the above
- ix. The no load current in a transformer lags behind the applied voltage by an angle of about
 (a) 180° (b) 120° (c) 90° (d) 75°
- x. Which of the following properties is not necessarily desirable for the material for transformer core ?
 (a) Low hysteresis loss (b) High permeability
 (c) High thermal conductivity (d) Adequate mechanical strength
- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- Why the armature core in DC machines is constructed with laminated steel sheets instead of solid steel sheets
 - Discuss various cooling arrangement for transformer
 - How does change in frequency affect the operation of a given Transformer?
 - What are properties of an ideal transformer?
- Q.3A Explain various power stages in dc generator with suitable diagram. 05
- Q.3B Explain the different methods used for the speed control of D.C. shunt motor 05
- Q.4A Using suitable diagram, explain the principle and operation of auto transformer. 05
- Q.4B Explain torque-current, speed-current and speed-torque characteristic of dc shunt and series motor 05
- Q.5A Explain open delta connection of transformer and show that in open delta connection power capacity is reduced by two third. 05
- Q.5B Describe the working of 3 point starter for DC shunt motor with neat diagram 05
- Q.6A A 500 V dc shunt motor takes 4 A on no load. The armature resistance including that of brushes is 0.2Ω and the field current is 1 A. Estimate output and efficiency when the input current is (a) 20 A (b) 100 A 05
- Q.6B A 4-pole, lap connected DC machine has 540 armature conductors. If the flux per pole is 0.03 Wb and runs at 1500 RPM, determine the emf generated. If this machine is driven as a shunt generator with same field flux and speed, calculate

the line current if the terminal voltage is 400V. Take shunt and armature resistance as the 450Ω and 2Ω respectively

OR

- Q.6B Consider a 20 KVA, 2200/220 V, 50 Hz transformer. The O.C./S.C. test results are as follows 05
O.C. test: 220 V 4.2 A 148W (l.v. side)
S.C. test: 86 V 10.5 A 360 W (h.v. side)
Determine the voltage regulation at full load 0.8 p.f. lagging

- Q.7A Explain in detail about parallel operation of single phase transformers. 05
Q.7B What is the armature reaction? Explain the effect of armature reaction on performance of D.C. Machine. 05

OR

- Q.7B Find the all-day efficiency of a 100 kVA, distribution transformer whose iron loss and full load copper loss are 0.5kW and 1.2 kW respectively. In a day it is loaded as follows 05

Duration(Hr)	Output(P_o) in kW	Power factor($\cos\phi_2$)
5	400	0.8
10	300	0.75
5	100	0.8
4	0	-

- Q.8 Describe open circuit and short circuit test of single phase transformer with suitable diagram. 10
Q.9A Draw detailed diagram of dc generator with neat and clean diagram. Also mentioned function of each component for same. 10
Q.9B Explain Ward-Leonard method of speed control with neat and clean diagram 10

OR

- Q.9B Explain back to back test with suitable circuit diagram. 10