

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), Nov.-Dec. 2016

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 the 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.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. In lap winding, the number of brushes is always
 - (a) double the number of poles
 - (b) same as the number of poles
 - (c) half the number of poles
 - (d) two
- ii. Brushes of D.C. machines are made of
 - (a) carbon
 - (b) soft copper
 - (c) hard copper
 - (d) all of above
- iii. 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
- iv. D.C. series generator is used
 - (a) for industrial load at constant voltage
 - (b) for traction load
 - (c) voltage at the toad end of the feeder
 - (d) for none of the above purpose
- v. In a D.C. generator the number of mechanical degrees and electrical degrees will be the same when
 - (a) r.p.m. is more than 300
 - (b) r.p.m. is less than 300
 - (c) number of poles is 4
 - (d) number of poles is 2
- vi. A sinusoidal voltage of 5 Hz is applied to the field of a shunt generator. The armature voltage wave
 - (a) will be zero
 - (b) will be of 50 Hz
 - (c) will be of 10VHz
 - (d) will be of 15 Hz
- vii. The maximum efficiency of a distribution transformer is

- (a) at no load (b) at 50% full load
(c) at 80% full load (d) at full load
- viii. Auto-transformer makes effective saving on copper and copper losses, when its transformation ratio is
(a) approximately equal to one (b) less than one
(c) great than one (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. 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) none of the above
(c) More losses (d) Not valid since the rate of change of flux is zero
- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- Enumerate the factors on which speed of a D.C. Motor depends.
 - What is core loss? What is its significance in electric machines?
 - Mention the difference between core and shell type transformers.
 - Define critical field resistance of the DC shunt generator
- Q.3A What is the summer's test? Draw the circuit diagram to conduct this test and explain its principle. 05
- Q.3B Explain all day efficiency and also compare auto transformer with two winding transformer on any three points. 05
- Q.4A Explain the effect of armature reaction in a DC shunt generator. How are its demagnetizing and cross-magnetizing ampere turns calculated? 05
- Q.4B Describe the working of 3 point starter for DC shunt motor with neat diagram. 05
- Q.5A Explain ward-leonard method of speed control in DC motors 05
- Q.5B Draw the circuit diagram for different types of DC generators 05
- Q.6A A 230V, DC shunt motor, takes an armature current at 3.33 Amp. at rated voltage and at a no load speed of 1000RPM. The resistances of the armature circuit and field circuit are 0.3Ω and 160Ω respectively. The line current at full load and rated voltage is 40A. Calculate, at full load, the speed and the developed torque in case the armature reaction weaken the no load flux by 4%. 05
- Q.6B A single-phase 100/200 V, 1 KVA transformer has copper losses in h. v. Side at 5 A equal to 80 W and iron losses as 60 W. Find the efficiency of the transformer at full load upf, and half load upf. 05

OR

- Q.6B Explain with the help of connection and phasor diagram, how the Scott connections are used to obtain two-phase supplies from 3-phase supply mains. 05

Q.7A A 10 KVA transformer has 400 watt iron losses and 600 watt copper losses. Determine maximum efficiency of the transformer at 0.8 power factor lagging. Also calculate the load at which the $\eta_{\max}$ occurs. 05

Q.7B Explain about the star-delta and delta-star connections used in 3-phase connection of transformers. Discuss their advantages and disadvantages 05

OR

Q.7B With the help of phasor diagram, explain the operation of a transformer under no load and load conditions. 05

Q.8 The following data were obtained on a 50 KVA 2400/120 V transformer: 10

Open circuit test, instruments on low voltage side :

Wattmeter reading = 396 Watts

Ammeter reading = 9.65 amperes

Voltmeter reading = 120 Volts

Short circuit test, instruments on high voltage side :

Wattmeter reading = 810 Watts

Ammeter reading = 20.8 amperes

Voltmeter reading = 92 Volts

Find the efficiency when rated KVA is delivered to a load having a power factor of 0.8 lagging.

Q.9A Explain transformer accessories in detail with suitable neat diagrams 10

Q.9B When a 250-V, 50 HP, 1000 RPM d.c shunt motor is used to supply rated output power to a constant torque load, it draws an armature current of 160A. The armature circuit has a resistance of 0.04Ω and the rotational losses are equal to 2 KW. An external resistance of 0.5Ω is inserted in series with the armature winding. For this condition compute 10

(i) The speed

(ii) The developed power

(iii) The efficiency assuming that the field loss is 1.6 K.W

OR

Q.9B What is a stepper motor? What are the features of stepper motor? Explain different types of stepper motor with suitable sketches. 10