# **C.U.SHAH UNIVERSITY Summer Examination-2019**

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Subject Name : Electrical Machine – I Subject Code : 4TE03EMC1 Semester : 3 Date : 20/03/2019

**Branch:** B.Tech (Electrical) Time : 02:30 To 05:30

Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

| Q-1 |            | Attempt the following questions:                                   | (14) |
|-----|------------|--|------|
|     | a)         | Define All day efficiency  |      |
|     | b)         | Define voltage regulation  |      |
|     | c)         | How may the direction of rotation of a d.c. motor be reversed?     |      |
|     | <b>d</b> ) | What is the function of interpoles?                                |      |
|     | e)         | The field coils of D.C. generator are usually made of              |      |
|     |            | (A) mica   |      |
|     |            | (B) copper   |      |
|     |            | (C) cast iron  |      |
|     |            | (D) carbon   |      |
|     | f)         | The critical resistance of the d.c. generator is resistance of     |      |
|     | -)         | (A) Armature   |      |
|     |            | (B) Field  |      |
|     |            | (C) Load   |      |
|     |            | (D) brushes  |      |
|     | g)         | Lap winding is suitable for Current ,                              |      |
|     | 0/         | d.c.generators.  |      |
|     |            | (A) High, low  |      |
|     |            | (B) Low, high  |      |
|     |            | (C) Low, low   |      |
|     |            | (D) High, high   |      |
|     | h)         | D.C. shunt motors are used for driving                             |      |
|     |            | (A) trains   |      |
|     |            | (B)cranes  |      |
|     |            | (C)hoists  |      |
|     |            | (D)machine tools   |      |
|     | i)         | The commercial efficiency of a shunt generator is maximum when its |      |
|     | -)         | variable losses equallosses.                                       |      |
|     |            | (A) Constant   |      |
|     |            | (B) Stray  |      |
|     |            | (C) Iron   |      |
|     |            | (D) Friction and windage   |      |
|     | i)         | A Step up transformer increases                                    |      |
|     | J <i>)</i> | The stop up transformer mereuses                                   |      |
|     |            |  | 1    |



- (A) Voltage
- (B) Current
- (C) Power
- (D) Frequency
- **k**) In a d.c.generator, the effect of armature reaction on the main pole flux is to
  - (A) Reduce it
  - (B) Distort it
  - (C) Reverse it
  - (D) Both (a) and (b)
- I) If B is the flux density, I the length of conductor and v the velocity of conductor, then induced e.m.f. is given by
  - (A)Blv
  - $(B) Blv^2$
  - $(C) Bl^2 v$
  - $(D)BI^2V^2$ .

### **m**) Power transformers are designed to have maximum efficiency at (A) nearly full load

- (B) 70% full load
- (C) 50% full load
- (D) no load
- **n**) In a 3-phase induction motor, the rotor field rotates at synchronous speed with respect to
  - (A) stator
  - (B) rotor
  - (C) stator flux
  - (D) none of the above

## Attempt any four questions from Q-2 to Q-8

#### Q-2 Attempt all questions

(14)

(14)

(14)

- Explain different types of D.C. generator. **(a)** (07) Explain the Construction Parts of D.C. Generator (1) Yoke (2) Pole (07) **(b)**
- Cores and Pole shoes (3) Commutator (4) Armature core (5) Brushes and bearing.

#### Q-3 Attempt all questions (14) Derive the torque equation of motor and also explain the armature and

- (07) **(a)** shaft torque. (07)
- **(b)** Explain the Speed control of D.C Shunt Motor.

#### 0-4 Attempt all questions

- Derive the EMF equation for single phase transformer with help of (07) **(a)** sketch. (07)
- **(b)** Explain the Equivalent circuit of Transformer.

#### **Q-5** Attempt all questions

- Define the term "slip" of induction motor. Draw and Explain the torque-(07) **(a)** slip characteristics of a three phase induction motor.
- Explain open and short circuit test for single phase transformer. While (07) **(b)**



making short circuit test, low voltage winding is always short circuited. Why?

| Q-6 | (a)        | Attempt all questions<br>A 30kVA, 2400/120 V, 50 Hz transformer has a high voltage winding<br>resistance of 0.1 $\Omega$ and a leakage reactance of 0.22 $\Omega$ . The low voltage<br>winding resistance is 0.035 $\Omega$ and the leakage reactance is 0.012 $\Omega$ . Find<br>the equivalent winding resistance, reactance and impedance referred to<br>the (i) high voltage side and (ii) the low voltage side. | (14)<br>(07) |
|-----|------------|--|--------------|
|     | <b>(b)</b> | Explain the Production of Rotating field of 3 Phase Supply for Induction   | (07)         |
| Q-7 |            | Attempt all questions  | (14)         |
|     | (a)        | A 30kVA, 2400/120 V, 50 Hz transformer has a high voltage winding resistance of 0.1 $\Omega$ and a leakage reactance of 0.22 $\Omega$ . The low voltage winding resistance is 0.035 $\Omega$ and the leakage reactance is 0.012 $\Omega$ . Find the equivalent winding resistance, reactance and impedance referred to the (i) high voltage side and (ii) the low voltage side.                                      | (07)         |
|     | <b>(b)</b> | Explain Swinburne's test to find the efficiency of a d. c. motor.  | (07)         |
| Q-8 |            | Attempt all questions  | (14)         |
|     | (a)        | Explain in detail armature reaction in dc machines.  | (07)         |
|     | <b>(b)</b> | Explain the methods of improving Commutation in D.C. Generator.  | (07)         |

