**BE Degree Examinations, OCT/NOV 2009**

**III Semester**

**Branch: E& I**

**U07EI302 Electrical Machines**

Time : 3 h Maximum Marks : 100

Answer **ALL**questions:

**PART A (10 x 1 = 10)**

**1.** The coil of 1000 turns is linking a flux of 0.01 Wb. The flux is reversed in an interval of 0.1 s. The average value of induced emf in the coil is

**A)** 5000 V **B)** 200 V **C)** 100 V **D)** 2 V

**2.** Which of the following DC motors will run at the highest speed on no-load/light load condition?

**A)** Shunt motor **B)** Series motor

**C)** Cumulative compound motor **D)** Differentially compound motor

**3**. The purpose of adding few percent silicon to steel in the manufacturing of Transformer core stampings is to reduce

**A)** primary copper loss **B)** secondary copper loss

**C)** eddy current loss **D)** hysteresis loss

**4.** A 20 kVA, 440 V/220 V single-phase Transformer has winding resistances 0.09 Ω and 0.022 Ω. The total resistance refereed to HV side is

**A)** 0.0445 Ω **B)** 0.0955 Ω **C)** 0.112 Ω **D)** 0.178 Ω

**5**. The rotor circuit frequency of a 3-phase induction motor operating on a 50 Hz supply with 4 % slip is

**A)** 0.4 Hz **B)** 2 Hz **C)** 4 Hz **D)** 20 Hz

**6.** In split-phase single-phase induction motor, the main winding should have

**A)** low resistance and low inductance

**B)** low resistance and high inductance

**C)** high resistance and low inductance

**D)** high resistance and high inductance

**7.** In a 3-phase, star connected Alternator, a field current of a 5 A gave open-circuit voltage of 415 V and short circuit current of 10 A. The value of synchronous impedance is

**A)** 23.96 Ω **B)** 41.5 Ω **C)** 47.92 Ω **D)** 71.88 Ω

**8.** In reluctance motor, when the salient pole axis of the rotor is aligned with the axis of the revolving magnetic field, the reluctance of the magnetic path is

**A)** zero **B)** minimum **C)** maximum **D)** nearly maximum

**9.** The secondary distribution is electric power system network is done by

**A)** single-phase single wire system **B)** 2-phase 2 wire system

**C)** 3-phase 3 wire system **D)** 3-phase 4 wire system

**10**. As per the current terminology, the transmission voltage between 300 to 765 are termed as

**A)** low voltages **B)** high voltages **C)** extra high voltages

**D)** ultra high voltages

Answer **ALL**questions:

**PART B (10 x 2 = 20)**

**11.** What are the reasons which cause the terminal voltage of DC shunt generator to get decreased as the load current is increased?

**12**. Why starters are used for DC motors? Name the type of starters used for DC shunt motor.

**13**. The emf per turn of a single phase, 6.6 kV/440 V, 50 Hz Transformer is approximately 12 V. Calculate the number of turns of HV and LV windings.

**14**. Why is the open circuit test generally performed on LV side of a Transformer?

**15**.List the different methods of speed control applicable to 3-phase squirrel cage Induction motor.

**16**. In what respect does a 1-phase Induction motor differ from a 3-phase Induction motor?

**17**.What are test data required for predetermining the voltage regulation of an Alternator by MMF method?

**18**. A stepper motor has 4 stator phases, 6 rotor teeth. Find its step angle.

**19.** What is the function of sub-stations? State its any two types.

**20.** What are the desirable properties of overhead line insulators?

**PART C (5 x 14 = 70)**

**21. i)** A shunt generator when driven at its rated speed fails to self-excite. Discuss the most likely reasons for this and state how you would proceed to remedy the fault**.**

(6)

**ii)** A DC shunt generator has an open circuit voltage of 250 V. When the machine is loaded, the terminal voltage is found to decease to 240 V. Find the load current if the field circuit resistance is 40 Ω and armature circuit resistance is 0.02 Ω. Neglect armature reaction. (8)

**OR**

**22. i)** A 6 pole DC motor has 936 wave connected armature conductors. The useful flux per pole is 0.02 Wb and the armature circuit resistance is 0.5 Ω . Calculate a) the speed and b) the torque developed when its armatures takes 35 A at 400 V. (6)

**ii)** What are the factors controlling the motor speed? Describe briefly the various methods of speed control of DC series motor. (8)

**23. i)** Develop an expression for the emf of a Transformer and hence show that the number of turns on the HV and LV windings are in the ratio of their windings. (6)

**ii)** A 100 kVA, 6.6 kV/415 V single-phase Transformer has an effective impedance of (3+j8) Ω referred to HV side. Estimate the full-load voltage regulation at 0.8 pf lagging. (8)

**OR**

**24.** Explain how the equivalent circuit parameters are determined from OC and SC tests. Also explain how the voltage regulation can be estimated by these tests**.**

**25. i)** A 3-phase slip-ring Induction motor has rotor resistance 0.03 Ω and standstill reactance 0.15 Ω per phase. What should be the value of external resistance per phase to be added to the rotor circuit in order to obtain maximum torque at starting condition? (6)

**ii)** Describe with a connection diagram the working of a direct-on-line starter for 3-phase Induction motor. (8)

**OR**

**26.** Explain clearly the action of a single phase Induction motor. Discuss the different methods of starting single phase Induction motors indicating the limitation and application o each method.

**27.** A 3.3 kV Alternator gave the following test results:

| Field current (A) | 16 | 25 | 37.5 | 50 | 70 |
|---|---|---|---|---|---|
| OC Voltage (kV) | 1.55 | 2.45 | 3.3 | 3.75 | 4.15 |

A field current of 18 A is found to cause the full-load current to flow through the winding during short-circuit test. Predetermine the full-load voltage regulation at 0.8 pf lagging by **EMF** method.

**OR**

**28.** Explain briefly the construction and working of Hysteresis motor with suitable sketches. Draw its speed torque characteristics. Also state its advantages and applications.

**29. i)**Briefly discuss technical advantages and disadvantages of DC and AC transmission systems**.** (6)

**ii)** Explain the operation of electric power system with single line diagram (8)

**OR**

**30.** Giving desirable characteristics of insulating materials used in cables, explain the various parts of a high voltage single-core, low tension cable with neat diagram.