Code No: RT21045 **R13** SET - 1

**II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov-2016**
**ELECTRICAL TECHNOLOGY**
(Com. to ECE, EIE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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## PART –A

1. a) What is the principles of electromechanical energy conversion
   b) Based on what principle a DC generator works?
   c) What are the applications of DC motors?
   d) What is the procedure for performing the open circuit test on a single phase transformer?
   e) Why starters are necessary for starting of 3-phase induction motors?
   f) What are the various applications of AC servomotors?

## PART -B

2. a) Using energy equation, derive an expression for force on a conductor of the armature of dc motor.
   b) For a single-excited magnetic system, derive the relation for the magnetic stored energy in terms of reluctance.

3. a) Explain the performance characteristics of shunt generator and derive the expression for critical speed.
   b) A separately exited generator when running at 1200 rpm supplies a current of 200 A at 125 V to a circuit of constant resistances .What will be the current when speed drops to 1000 rpm if the field current is unaltered? Armature resistance is 0.04 ohms and the total voltage drop at brushes is 2 V. Ignore the change in armature reaction

4. a) Derive an expression for torque developed in the armature of DC motor
   b) Explain the operation principle of 3-point starter with neat diagram?

5. a) Draw and explain the phasor diagram for a single phase transformer when it is connected to a resistive load?
   b) Short-circuit test is conducted on a 5KVA, 400V/100 V single phase transformer with 100 V winding shorted. The input voltage at full load current is 40 V. The wattmeter, on the input reads 250 W. Find the power factor for which regulation at full load is zero.

6. a) Derive the expression for torque of an Induction motor under no load and running conditions.
   b) The power input to a rotor of 400V, 50 Hz, 3-phase, 12 pole Induction motor is 100w.The rotor emf has a frequency of 2Hz. Calculate
   (i) slip (ii) Rotor speed (iii) rotor Cu losses (iv) Mechanical power developed.

7. Briefly discuss the constructional details of various types of capacitor motors in 1-ϕ induction motor.

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Code No: RT21045 **R13** SET - 2

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(Com. to ECE, EIE)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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**PART –A**

1. a) Define energy and co-energy
   b) What are the important characteristics of DC generator?
   c) What is the necessary of a starter for DC motor?
   d) Prove the condition for maximum efficiency of a transformer?
   e) Why the rotor of a three phase induction motor can never attain the synchronous speed
   f) What are the salient features of Servomotors?

**PART -B**

2. a) Discuss the necessity of a multiple excited magnetic field system in certain electromechanical devices.
   b) A cylindrical rotating machines has the following parameters $L_{ss} = 0.15H$, $L_{rr} = 0.06H$, $L_{sr} = 0.08\cos\theta H$. Determine the voltage induced in the rotor and its frequency where the rotor rotating at 3000 rpm and stator current is 5A at 50Hz.

3. a) What is a separately and self exited DC generators, Explain them with help of neat sketches
   b) A 6-pole wave connected DC generator has 1000 armature conductors and a flux/pole of 0.035wb. At which speed must it be driven to generate 600V?

4. a) What are the different methods speed controls of DC motor? Give the advantages and disadvantages
   b) An 800 kW, 500 V DC shunt generator has fallowing data: armature resistance is 0.005ohms,mechanical losses is 10 kW, iron losses is 11kW,shunt field resistance is 50 ohms, brush contact drop is 1 V per brush and stray loss is 1% of output. Find (i) efficiency at full load and (ii) efficiency at half load.

5. a) Discuss how you perform open circuit test and short circuit tests on a single phase transformer in the laboratory. How do you find the efficiency of the transformer?
   b) The voltage per turn of a single phase transformer is 1.1V. When the primary winding is connected to a 220V, 50Hz A.C. Supply, the secondary voltage is found to be 550V. Find (i) Primary and Secondary turns. (ii) Core area if the maximum flux density is 1.1T.

6. a) Explain why a 3-phase induction motor cannot develop torque when running at synchronous speed.
   b) Calculate the synchronous speed, %slip and rotor frequency of three-phase, 50Hz, 6-pole Induction motor running at 970rpm.

7. Explain the constructional details of shaded pole 1-ϕ induction motor.

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Code No: RT21045 **R13** SET - 3

**II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov-2016**
**ELECTRICAL TECHNOLOGY**
(Com. to ECE, EIE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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## PART –A

1. a) What is the basic principle of single excited machine
   b) What are the causes of failure to excite self excited generator?
   c) Obtain the condition for maximum efficiency
   d) What is the need of stepping up and stepping down voltages in a power system
   e) Define the slip of an induction motor.
   f) Why 1-phase induction motor is not self starting

## PART -B

2. Define energy and co-energy and explain how that torque expression for an electro-mechanical energy conversion is derived from these.

3. a) Draw and explain the no-load magnetization characteristics of a separately excited generator?
   b) Derive the expression for emf generated in a DC machine

4. a) Which method preferred when speed of a DC shunt motor is to be controlled below rated speed and explain with help of diagram.
   b) A 220V DC shunt motor has an armature resistance of 0.5ohms and is excited the procedure constant flux. At full load the motor runs at 1000rpm.Taking an armature current of 40A. If a resistance of 0.8ohms is inserted in series with the armature determine speed at the full load.

5. a) Develop the equivalent circuit of a single phase transformer.
   b) Find (i) active and reactive components of no load current and
   (ii) no load current of a 440/220V single phase transformer if the power input on no load to the high voltage winding is 80W and power factor of no load current is 0.3 lagging.

6. Explain how the rotating magnetic field is developed in a 3-ø induction Motor?

7. a) Explain how the pulsating mmf of a 1-phase induction motor may be considered equivalent to two oppositely rotating fields. Develop an expression for the torque of the motor.
   b) Explain how 1-phase motors are classified depending on construction & method of starting?

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Code No: RT21045 **R13** SET - 4

**II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov-2016**
**ELECTRICAL TECHNOLOGY**
(Com. to ECE, EIE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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## PART –A

1. a) Derive the expression for forces and torque in a magnetic field systems
   b) State the purpose of magnetic yoke in a DC machine
   c) What are the various factors affecting the torque of a DC motor
   d) What is a transformer?
   e) List out the merits and demerits of slip ring and squirrel cage induction motor.
   f) How 1-phase motors are classified depending on construction and method of starting?

## PART -B

2. a) Explain the multi excited magnet field system with necessary diagrams.
   b) The $\lambda$-relationship for an electromagnetic system is given by $\lambda = \frac{1.2\, i^{1/2}}{g}$, where $g$ is the air gap length. For current $i$=2A, and $g$=10cm. Determine the mechanical force on the moving part using a) energy of the system and b) co-energy of the system.

3. Explain the construction features of a DC machine with the help of neat sketches?

4. a) Explain principle of operation of 4-pole starter with neat diagram
   b) A short shunt compound DC generator supplies a current of 75A at a voltage of 225V. Calculate the generated voltages if the resistance of armature, shunt field and series field windings are 0.04ohms, 90ohms, and 0.02ohms respectively.

5. a) Explain the constructional details of a single phase transformer.
   b) A 4 KVA, 200/400V, 50Hz single phase transformer is supplying full load current at 0.8 power factor. The following are the test results:
   O.C. Test (LV Side) : 200V, 0.8A, 70W (L.V. Side)
   S.C. Test (HV Side): 20V, 10A, 60W (H.V. Side)
   Calculate efficiency, secondary voltage and current into primary at the above load.

6. a) Explain any one method of starting of an induction motor with neat diagram.
   b) Calculate the synchronous speed, slip, slip speed and rotor frequency of three-phase, 50Hz, 4-pole Induction motor running at 1440rpm.

7. Explain double field revolving theory with the help of neat diagrams

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