Code No: RT21026 **R13** SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

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) Explain the action of coupling medium in case of generator and motor.
   b) Mention the difference between lap and wave winding.
   c) What are the requirements of voltage build up in self excited D.C generator.
   d) Why starter necessary for a dc motor?
   e) What are the factors that affect the choice of number of poles.
   f) Explain the function of commutator in DC generators.
   g) What is the condition for maximum power developed in dc motors and what is the efficiency of the motor at that condition. (4M+4M+3M+4M+2M+3M+2M)

PART - B

2. a) What is an "Electromechanical energy conversion device"? Explain
   b) In a rectangular electromagnetic relay the exciting coil has 100 turns. Cross sectional area of the core is $25cm^2$ neglect the reluctance value of the magnetic circuit. Calculate maximum mechanical force on the armature if the saturated flux density in the iron is 1.8tesla.

3. The shunt generator delivers full load current of 200 V. The shunt field resistance is 60ohms and full load efficiency is 90%. The starting losses are 800w. Find,
   a) armature resistance
   b) current at which maximum efficiency occurs
   c) total losses
   d) armature copper losses

4. A 250V, 4 pole shunt has two circuit armature winding with 500 conductors. The armature circuit resistance is 0.25 ohms field resistance is 125 ohms and the flux per pole is 0.02 Wb neglect armature reaction. Find the speed and torque developed if the motor draws 14A from the mains.

5. If a break test conducted on a dc shunt motor the full load readings are observed as tension on tight side is 9.1kg tension on slake side is 0.8kg total current is 10A supply voltage is 110v speed is 1320 rpm radius of the pulley is 7.5 cm calculate full load efficiency.
   Explain the purpose of retardation test and how it would be conducted on DC shunt motors?

6. Estimate the specific electric and magnetic loading of a 500kW, 500V, 500 rpm, 8 pole DC generator whose diameter is 1.0 m and length is 0.28 m, lap wound with 900 conductors.

7. What do you mean by armature reaction in D.C. machines? Show on a diagram its effect on the flux distribution.

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Code No: RT21026 **R13** SET - 2

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

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 energy balance equation?
   b) Discuss the role of inter poles in improving commutation
   c) Classify D.C generators based on their field excitation.
   d) Explain constant and variable losses in DC motors.
   e) Explain armature reaction in dc motors.
   f) Explain the difference between 3-point and 4-point starters. (2M+4M+4M+4M+4M+4M)

PART - B

2. a) Give the example of singly- excited and doubly- excited electromechanical energy conversion devices.
   b) In an electromagnetic relay, the exciting coil has1200 turns the cross sectional area of the core is 25 cm^2. Reluctance of the magnetic path may be neglected. Find the inductance of the coil with an air gap of 1cm. Find the field energy and force on armature if current in the coil is 2 Amp.

3. A D.C shunt generator has following open circuit magnetizing curve at its rated speed

Field current(A)	0.5	1.0	1.5	2	3	4
E.M.F(V)	180	340	450	500	550	570

   The resistance of the field circuit is 200ohms. The generator is driven at its rated speed. Find the terminal voltage on open circuit.

4. a) Derive the condition for maximum efficiency in dc motor.
   b) A 4 pole dc series motor has 100 wave connected armature conductors. At a certain load, the total mechanical power developed is 4kW and flux per pole is 20m Wb. Calculate the line current taken by the motor and the speed at which it will run with an applied voltage of 200V. The total motor resistance is 1ohm.

5. What are the different speed control methods of D.C shunt motor? Explain each method with advantages and disadvantages.

6. On what factors does the length of air gap in DC machine depend? Also find an expression for estimation of air gap length.

7. a) What are the conditions for parallel operation of shunt generators?
   b) Two shunt generators are operating in parallel. The e.m.f. induced in one machine is 260 V and that induced in the other machine is 270 V. They supply together a load current of 1800 A. If the each machine has an armature resistance of 0.04 ohm and field resistance 50 ohms, determine: Terminal voltage and Output of each machine.

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Code No: RT21026 **R13** SET - 3

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

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 significance of co energy?
   b) A 4 pole 1200 rpm generator with lap winding armature has 65 slots and 12 conductors per slot the flux per pole is 0.02webers calculate the emf induced in the armature.
   c) Give the applications of cumulative and differential compound excited D.C generator.
   d) Explain electric braking by plugging.
   e) How are demagnetising and cross- magnetising ampere – turns/ pole in a D.C. machine calculated.
   f) What are the causes of sparking in D.C. machines? (3M+4M+4M+4M+4M+3M)

Part-B

2. a) Derive the expression for force in a doubly excited system in the linear case.
   b) In 300kw 500v 6 pole lap winding dc generator has70 slots with 12 conductors per slot .if the brushes are advanced by 3.33 mechanical degrees. Find the number of demagnetising ampere turns required per pole.

3. What is critical field resistance? How do u calculate critical field resistance from magnetic characteristics in the laboratory?

4. a) Derive the equation for torque developed by a dc motor.
   b) The no-load armature current of a 230V, dc shunt motor is 0.2A at a speed of 1200rpm. If the full load armature current is 40A,find the full load speed and torque developed. Assume that the armature resistance is 0.25ohm and the field flux remains unaltered.

5. Explain the Swinburne's test to determine no-load looses of DC machine. What are the limitations of this test?

6. Drive the output equation of a DC machine.

7. a) Obtain the condition for maximum efficiency in dc motors.
   b) A 230V d.c. shunt motor takes 3A on no-load running at 1500rpm. The armature resistance is I ohm and shunt field resistance is 200 ohms calculate
   i) the speed and ii) torque developed when the input is 7.5 kW.

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Code No: RT21026 **R13** SET - 4

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

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) Coil of 1200 turns on a core would create flux of 2mWb when carrying of 1 ampere. Calculate the energy stored in the magnetic field.
   b) Discuss armature reaction in D.C machines and its effect on the performance.
   c) Draw the schematic diagram of dc shunt motor. Also write the back emf, current and voltage equation.
   d) Explain regenerative braking in DC motors.
   e) What are the different methods of speed control of a D.C motor?
   f) Explain the role of Yoke in dc machines. (4M+3M+4M+4M+4M+3M)

PART-B

2. a) Derive an expression for mechanical force developed for singly excited magnetic field system.
   b) A 4 pole lap wound dc generator drives a full load current of 400 amperes. It has shunt field current of 12 amperes and 123 commutator segments in a commutator ring of a machine. If the brushes are advanced by three commutator segments on full load. find
   (i) demagnetising ampere turn per pole. (ii) Cross magnetising ampere turn per pole.

3. Draw a neat graph to show open circuit characteristics of a separately excited D.C generator. Why is a field regulator necessary for this machine

4. a) What are the losses that occur in dc machine? How they vary as the load increases.
   b) A 12 pole lap connected 230V shunt motor has 410 conductors. It takes 41A on full-load. The flux per pole is 0.05wb. The armature and field resistance are 0.1ohm and 230ohm respectively. Contact brush is 01.V. Determine the speed of motor at full-load.

5. Explain with neat circuit diagram, how can you find the efficiency of small DC motor with brake test.

6. The following results are obtained during Hopkinson's test on two similar 230v machines armature currents are 37A and 30A. Field currents are 0.85A and 0.8A calculate the efficiencies of the machines if each has an armature resistance of 0.33Ω.

7. A 240V DC shunt motor takes 60A and runs at 1200 rpm. Ra = 0.4 ohms and Rf = 100ohms. Find the
   (a) output
   (b) copper losses and
   (c) efficiency if iron and frictional losses amount to 1400W.

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