Enrollment No......................................

Faculty of Engineering
End Sem (Even) Examination May-2019
EE3CO13 / EX3CO13 Electrical Machines-II
Programme: B.Tech.   Branch/Specialisation: EE/EX

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1   i.   The basic principle of DC generator is depending on the following **1**
principle
(a) Fleming left hand rule   (b) Fleming Right hand Rule
(c) Lenz Law   (d) All of these

ii.   The role of commutator in DC generator is   **1**
(a) Convert ac into dc   (b) Convert dc into ac
(c) Both (a) and (b)   (d) None of these

iii.   DC motor is used to convert energy   **1**
(a) Chemical to electrical   (b) Chemical to mechanical
(c) Electrical to mechanical   (d) Mechanical to electrical

iv.   The basic principle of DC motor is depending on the following **1**
principle
(a) Fleming left hand rule   (b) Fleming Right hand Rule
(c) Lenz Law   (d) All of these

v.   In an alternator the winding through which a current is passed to **1**
produce the main flux is called the
(a) Field winding   (b) Armature Winding
(c) Primary winding   (d) Secondary winding

vi.   In an alternator the winding in which voltage is induced is called the **1**
(a) Field winding   (b) Armature Winding
(c) Primary winding   (d) Secondary winding

vii. In a synchronous machine the ratio of the field current required to generate rated voltage to the field current required to circulate rated armature current on short circuit is known as the **1**
(a) Thevenin's voltage   (b) Form factor
(c) Peak factor   (d) Short circuit ratio

viii. The synchronous generator is also called as **1**
(a) Alternator   (b) Condenser   (c) Booster   (d) Inverter

ix. The synchronous motor is called as **1**
(a) Doubly excited motor   (b) Singly excited motor
(c) Both (a) and (b)   (d) None of these

x. A stepper motor move through **1**
(a) Electrical Pulse   (b) Continuous applied voltage
(c) Both (a) and (b)   (d) None of these

Q.2   i.   What is armature reaction? How the armature reaction minimized? **2**

     ii.   Derive the EMF equation of DC generator. **3**

     iii.   Describe with relevant diagrams the different methods of excitation of dc generator. **5**

OR   iv.   A DC generator has an armature emf of 100V when the useful flux per pole is 20mWb and the speed is 800 RPM. Calculate the generated emf **5**
(a) With the same flux and a speed of 1000 RPM.
(b) With a flux per pole of 24mWb and a speed of 900 RPM.

Q.3   i.   What is the necessity of a starter for a dc motor? Explain with neat sketch the working of a 3-point dc shunt motor starter, bringing out the protective features incorporated in it. **4**

     ii.   Describe Swinburne's test with the help of a neat sketch to find out the efficiency of a dc motor. What are the main advantages and disadvantages of this test? **6**

OR   iii.   A shunt generator delivers 50kW at 250V when running at 400RPM. The armature and field resistance are 0.02ohm and 50ohm respectively. Calculate the speed of the machine when running as a shunt motor and taking 50kW input at 250V. Allow 1V per brush for contact drop. **6**

Q.4   i.   Derive the EMF equation of an alternator. Explain clearly the meaning of distribution and coil span factor. **4**

     ii.   Explain MMF method of determining the voltage regulation of alternator. **6**

OR   iii.   Explain ZPF method of determining the voltage regulation of alternator. **6**

Q.5   i.   Describe the slip test method for the measurement of X_d and X_q of synchronous machine. **4**

     ii.   Derive an expression for finding regulation of salient pole alternator using two reaction theory. Draw its phasor diagram. **6**

OR   iii.   Write short note on the following: **6**
(a) Hunting and damper winding
(b) Parallel operation of infinite bus bar

Q.6   Attempt any two:

     i.   Explain the operation of a synchronous motor under: **5**
(a) Constant load and varying excitation
(b) Constant excitation and varying load.

     ii.   A 3 phase 11000V, star connected synchronous motor takes a load current of 100A. The effective reactance and resistance per phase are 30ohm and 0.8ohm respectively. Find the power supplied to the motor and induced emf for **5**
(a) 0.8 power factor lagging   (b) 0.8 power factor leading

     iii.   Write short note on the following: **5**
(a) Super synchronous motor   (b) Stepper motor

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Marking Scheme
EE3CO13 / EX3CO13 Electrical Machines-II

Q.1 i. The basic principle of DC generator is depending on the following **1** principle
(b) Fleming Right hand Rule

ii. The role of commutator in DC generator is **1**
(a) Convert ac into dc

iii. DC motor is used to convert energy **1**
(c) Electrical to mechanical

iv. The basic principle of DC motor is depending on the following **1** principle
(a) Fleming left hand rule

v. In an alternator the winding through which a current is passed to **1** produce the main flux is called the
(a) Field winding

vi. In an alternator the winding in which voltage is induced is called the **1**
(b) Armature Winding

vii. In a synchronous machine the ratio of the field current required to **1** generate rated voltage to the field current required to circulate rated armature current on short circuit is known as the
(d) Short circuit ratio

viii. The synchronous generator is also called as **1**
(a) Alternator

ix. The synchronous motor is called as **1**
(a) Doubly excited motor

x. A stepper motor move through **1**
(a) Electrical Pulse

Q.2 i. Armature reaction | 1 mark | **2**
Armature reaction minimized | 1 mark

ii. Derive the EMF equation of DC generator. | | **3**
1 mark for each step | (1 mark * 3)

iii. Methods of excitation of dc generator | 3 marks | **5**
Diagram | 2 marks

OR iv. Calculate the generated emf | | **5**
(a) With the same flux and a speed of 1000 RPM. | 2.5 marks
(b) With a flux per pole of 24mWb and a speed of 900 RPM.
| 2.5 marks

Q.3 i. Necessity of a starter for a dc motor | 1 mark | **4**
Diagram | 1 mark
Working of a 3-point dc shunt motor starter | 2 marks

ii. Swinburne's test with diagram | 1 mark | **6**
To find out the efficiency of a dc motor | 3 marks
Advantages and disadvantages | 2 marks

OR iii. Calculate the speed of the machine when running as a shunt motor and **6** taking 50kW input at 250V. Allow 1V per brush for contact drop.
Stepwise marking

Q.4 i. EMF equation of an alternator | 2 marks | **4**
Meaning of distribution | 1 mark
Coil span factor. | 1 mark

ii. MMF method of determining the voltage regulation of alternator. | | **6**
2 marks for each | (2 marks * 3)

OR iii. ZPF method of determining the voltage regulation of alternator. | | **6**
2 marks for each | (2 marks * 3)

Q.5 i. Slip test method for the measurement of X_d | 2 marks | **4**
Slip test method for the measurement of X_q | 2 marks

ii. Expression for finding regulation of salient pole alternator using two **6** reaction theory. | 4 marks
Phasor diagram. | 2 marks

OR iii. Write short note on the following: | | **6**
(a) Hunting and damper winding | 3 marks
(b) Parallel operation of infinite bus bar | 3 marks

Q.6 Attempt any two:
i. Explain the operation of a synchronous motor under: | | **5**
(a) Constant load and varying excitation | 2.5 marks
(b) Constant excitation and varying load. | 2.5 marks

ii. Find the power supplied to the motor and induced emf for | | **5**
(a) 0.8 power factor lagging | 2.5 marks
(b) 0.8 power factor leading | 2.5 marks

iii. Write short note on the following: | | **5**
(a) Super synchronous motor | 2.5 marks
(b) Stepper motor | 2.5 marks

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