

# KADI SARVA VISHWAVIDYALAYA

BE SEMESTER 3<sup>rd</sup> EXAMINATION(DECEMBER/2016)

SUBJECT CODE: EC-305

SUBJECT NAME: Electrical Machines

DATE: 28/12/2016

TIME: 10:30am To 1:30pm

TOTAL MARKS: 70

**Instructions:**

1. Answer each section in separate answer Sheet.
2. Use of scientific calculator is permitted.
3. All questions are compulsory.
4. Indicate **clearly**, the options you attempted along with its respective question number.
5. Use the last page of main supplementary for rough work.

## Section-1

- Q.1** (A) Why induction motor is self started? Explain with rotating magnetic field. **05**  
(B) Derive an emf equation for transformer with usual notation. **05**  
(C) What is the constructional difference between core type and shell type transformer? What are the merits and demerits of each? **05**

**OR**

- Q.2** (A) Explain 3-point starter for DC motor in brief. **05**  
(B) Justify:  
    (i) Compare the DC motor and AC motor.  
    (ii) DC Series motor should never be started without mechanical load. **05**

**OR**

- Q.2** (A) Explain various types of losses occurring in a D.C. machine. **05**  
(B) State methods to control speed of DC shunt motor. Explain the flux control method. **05**  
**Q.3** (A) Explain the voltage control method for DC Shunt Motor. **05**  
(B) Explain the working principle of transformer. **05**

**OR**

- Q.3** (A) Compare single phase and three phase transformer. **05**  
(B) What is slip in induction motor? Explain torque-slip curve of induction motor. **05**

## Section-2

- Q.4** (A) Compare lap and wave winding. **05**  
(B) What is construction difference between slip-ring and squirrel cage induction motor? What are the merits of each? **05**  
(C) Explain the speed torque characteristic of a 3-phase induction motor with necessary diagram. **05**

**OR**

- Q.5** (A) Explain speed torque characteristics of DC shunt motor. **05**  
(B) Discuss the conditions to be satisfied for proper synchronization of two alternators. **05**  
(B) Derive the emf equation of an alternator and give different applications of its. **05**

**OR**

- Q.5** (A) Explain working principle with necessary diagrams of any two single phase induction motors. **05**  
(B) Explain the speed torque characteristics of shunt motor. **05**

- Q.6** (A) Mention the types of starters for a three phase induction motor. Explain DOL starter in detail. **05**  
(B) Explain working principle and construction of induction motor. **05**

**OR**

- Q.6** (A) Derive equitation of starting torque and running torque of induction motor. **05**  
(B) Explain the construction of a salient pole synchronous machine. **05**

# KADI SARVA VISHWAVIDHYALAYA

## B.E. Semester III

**Subject Code:-EC-305**

**Subject Name:-Electrical Machines**

**Date: 17/04/2015**

**Time: 10:30 am to 1:30 pm**

**Total Marks:-70**

### Instructions:

1. Answer each section in separate Answer sheet.
2. Use of scientific calculator is permitted.
3. All questions are **compulsory**.
4. Indicate clearly, the options you attempt along with its respective Question number.
5. Use the last page of main supplementary of **rough work**.

### Section-I

#### **Q:1 (All compulsory)**

- (A) Draw a neat sketch of a D.C.machine with label, Describe its different parts their material and functions. [05]
- (B) Explain characteristics of DC compound generator. [05]
- (C) State application of DC series, Shunt & compound generator. [05]

**OR**

- (C) Explain characteristic of DC shunt generator. [05]

#### **Q-2 Answer the following question.**

- (A) Explain the basic principle of D.C.motor. Derive its torque equation. [05]
- (B) A 4 pole DC shunt generator has 598 wave connected armature conductors running at 800 rpm, supplies a load of  $15.5\Omega$  resistance at a terminal voltage of 250V. Armature resistance is  $0.26\Omega$  and shunt field resistance is  $230\Omega$ . Find out armature current, the induced emf and flux per pole.

**OR**

- (A) Explain briefly how speed control is achieved for DC shunt motors ? [05]
- (B) A 230 V DC series motor has an armature resistance of  $0.2\Omega$  and Series field resistance of  $0.10\Omega$ . Determine:(i) The current required to develop a torque of 70Nm at 1200 rpm(ii) percentage reduction in flux when the machine runs at 2000 rpm at half the current. [05]

#### **Q-3 Answer the following question.**

- (A) Draw the characteristic curves and state two applications for (i) a D.C shunt motor (ii) a D.C series motor. [05]
- (B) Give classification of induction motor based on principle of operation. [05]

**OR**

- (A) Explain the speed torque characteristic of a 3-phase induction motor with necessary diagram. [05]
- (B) Explain different methods to control speed of three phase induction motor. [05]

## Section-II

**Q-4 (All compulsory)**

- (A) Derive the equation of torque under running condition for three phase induction [05] motor.
- (B) Explain how does the rotor of induction motor rotate? Explain slip of induction [05] motor. Explain frequency of rotor current.
- (C) Explain different types of single phase induction motor. [05]

**OR**

- (C) Explain various types of losses occurring in induction motor. [05]

**Q-5 Answer the following question.**

- (A) Give comparison between Rotating & Pulsating magnetic field. [05]
- (B) Explain universal motor. [05]

**OR**

- (A) Derive EMF equation of A.C. Generator. [05]
- (B) Explain construction and type of A.C. Generator. [05]

**Q-6 Answer the following question.**

- (A) Define transformer and derive EMF equation for single phase transformer. [05]
- (B) Explain the working of a single phase transformer. [05]

**OR**

- (A) Explain the construction of a three phase transformer from the view point of its [05] working principle.
- (B) Explain parallel operation of alternators. [05]

-----**All the Best**-----

# KADI SARVA VISHWAVIDHYALAYA

## BE SEMESTER III (EC)

Subject code: - EC 305

Subject Name: - Electrical Machines

Date: - 28 / 11 / 2013

Time: - 3 hrs

Total Marks:- 70

### Instructions:

1. Answer each question in separate Answer sheet.
2. Use of Scientific calculator is permitted.
3. All questions are **compulsory**.
4. Indicate **clearly**, the options you attempt along with its respective question number.
5. Use the last page of main supplementary of **rough work**.

### Section – I

**Q -1** (A) Draw and explain the construction of a DC machine. [5]

(B) Explain External and Internal characteristic of D.C. shunt generator. [5]

(C) Draw and explain the speed-torque characteristic of a D.C. shunt and series motor. [5]

**OR**

(C ) Sketch and explain the torque-slip characteristic of a three phase induction motor. [5]

**Q-2** (A) Derive the Torque equation of D.C. motor. [5]

(B) Explain speed control methods of D.C. series motor. [5]

**OR**

(A) Explain working principle of D.C. motor. [5]

(B) Determine developed torque and shaft torque of 220 V, 4 pole D.C. series motor with 800 conductors wave connected supplying a load of 8.2 kw by taking 45 A from the mains. The flux per pole is 25 mWb and its armature circuit resistance is  $0.6 \Omega$ . [5]

**Q-3** (A) Draw and explain construction of 3 – phase Induction motor. [5]

(B) Explain principle of operation of 3 – phase Induction motor and define Slip. [5]

**OR**

- (A) List speed control methods of three phase induction motor and Explain any one method of speed control for slip ring Induction motor. [5]
- (B) A 3- $\phi$  induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate (1) the synchronous speed (2) the rotor speed when slip is 4 %. [5]

### Section - II

- Q-4** (A) Explain the working principle of a transformer. List the types of transformer. [5]
- (B) Draw and explain the construction of shell type and core type transformer. [5]
- (C) Explain the construction of Three phase transformer and give the names of three phase transformer connections. [5]

**OR**

- (C) State different methods of cooling of Transformer and explain any two methods. [5]

- Q-5** (A) Explain the principle and working of Capacitor Start single phase Induction Motor. [5]
- (B) Give comparison between single phase and three phase Induction motor. [5]

**OR**

- (A) Explain double field revolving theory for the single phase Induction motor. [5]
- (B) Explain construction and operation of Universal motor. [5]

- Q-6** (A) Explain construction of Alternator. [5]
- (B) What is voltage regulation of an Alternator? Explain any one method to determine voltage regulation of Alternator. [5]

**OR**

- (A) Explain operation of Alternator on Load. [5]
- (B) Explain parallel operation of Alternators. [5]

**All the Best**

# KADI SARVA VISHWAVIDHYALAYA

B.E. Semester III (April 2014)

Subject Code:- EC-305

Subject Name:- Electrical Machine

Date:- 28/04/2014

Time:- 10:30 a.m TO 1:30 p.m

Total Marks - 70

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## Instructions:

1. Answer each section in separate answer sheet.
  2. Use of scientific calculator is permitted.
  3. All the questions are **compulsory**.
  4. Indicate **clearly**, the options you attempt along with its respective question number.
  5. Use the last page of main supplementary for **rough work**.
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## Section-I

### Q-1. Answer the following questions.

- (A) Draw schematic diagram of a dc machine with labels. Describe its different parts; their material and functions. 5
- (B) Derive an expression for e.m.f. of a DC generator 5
- (C) Draw & explain O.C.C characteristics of separately excited generator. 5

OR

- (C) A DC shunt generator has shunt field winding resistance of  $100 \Omega$ . It is supplying a load of 5kW at a voltage of 250V. If its armature resistance is  $0.22 \Omega$  calculate the induced e.m.f. of generator. 5

### Q-2. Answer the following questions.

- (A) Explain characteristics of DC compound motor 5
- (B) A 4-pole, 250V, DC series motor has a wave connected armature with 200 conductors. The flux per pole is 25mWb when motor is drawing 60 A from the supply. Armature resistance is  $0.15 \Omega$  while series field winding resistance is  $0.2 \Omega$ . Calculate the speed under this condition. 5

OR

- (A) Draw & explain four point starter. 5
- (B) Explain any two methods of speed control of DC shunt motor. 5

### Q-3. Answer the following questions.

- (A) Discuss the difference between core type and shell type transformer. 5

- (B) Draw the phasor diagram of single phase transformer on load, considering  
(i) Inductive Load (ii) Resistive load (iii) Capacitive load

OR

- (A) Why is single phase induction motor not self-starting? Explain double field revolving theory.

- (B) Give classification of single phase induction motor. Explain any one in detail

**Section -II**

**Q-4. Answer the following questions.**

- (A) Draw and explain the power stages in an induction motor.

- (B) Explain production of three phase rotating magnetic field. Draw necessary figures.

- (C) Explain different methods of speed control of induction motor.

OR

- (C) Explain the relation between torque and slip for a three phase induction motor. Also draw torque-slip curve.

**Q-5. Answer the following questions.**

- (A) Explain the construction of a three phase transformer. Also state its advantages.

- (B) A single phase transformer has 350 primary and 1050 secondary turns. The primary is connected to 400 V, 50 Hz a.c. supply. If the net cross sectional area of the core is  $50 \text{ cm}^2$ , calculate i) The maximum value of the flux density in the core ii) The induced e.m.f. in the secondary winding.

OR

- (A) Explain the operation of universal motor.

- (B) Explain open circuit and short circuit test performed on transformer. Why are these tests to be performed?

**Q-6. Answer the following questions.**

- (A) Explain constructional features of the synchronous motor.

- (B) Explain working of an elementary D.C. Generator.

OR

- (A) Derive the e.m.f. equation of an A.C generator.

- (B) What is meant by voltage regulation of an alternator? State the methods to determine voltage regulation of an induction motor. Explain any one in detail

\*\*\*\*\* ALL THE BEST \*\*\*\*\*

# KADI SARVA VISHWAVIDHYALAYA

## B.E. Semester III

Subject Code:- EC-305

Subject Name:-Electrical Machines

Date: 19/11/2014

Time: 10:30 am to 1:30 pm

Total Marks:- 70

### Instructions:

1. Answer each section in separate Answer sheet.
2. Use of scientific calculator is permitted.
3. All questions are **compulsory**.
4. Indicate **clearly**, the options you attempt along with its respective Question number.
5. Use the last page of main supplementary of **rough work**.

### Section-I

#### Q:1 (All compulsory)

- (A) Draw a neat sketch of a DC machine with label, Describe its different parts their material and functions. [05]
- (B) Explain characteristics of DC compound generator. [05]
- (C) Explain briefly how speed control is achieved for DC shunt motors ? [05]

OR

- (C) Explain internal and external characteristic of DC shunt generator. [05]

#### Q-2 Answer the following question.

- (A) Explain the basic principle of DC motor. Derive its torque equation. [05]
- (B) What is necessity of starter for DC motor? Explain three point starter. [05]

OR

- (A) Draw the characteristic curves and state two applications for (i) a DC shunt motor (ii) a DC series motor. [05]
- (B) Calculate the voltage induced in the armature winding of a 4-pole, wave wound dc machine having 826 conductors and running at 1500 rpm. The flux per pole is 45mWb. [05]

#### Q-3 Answer the following question.

- (A) Define transformer and derive EMF equation for single phase transformer. [05]
- (B) Explain briefly the construction and working principle of the single phase transformer [05]

OR

- (A) State application of DC series, shunt & compound generator. [05]
- (B) A 230 V d.c. series motor has an armature resistance of  $0.3 \Omega$  and Series field resistance of  $0.15 \Omega$ . Determine: (i) The current required to develop a torque of 70Nm at 1400 rpm (ii) percentage reduction in flux when the machine runs at 2000 rpm at half the current. [05]

## Section-II

**Q-4 (All compulsory)**

- (A) Explain Open circuit and Short circuit test of transformer and their applications. [05]
- (B) Explain the construction of a three phase transformer from the view point of its working principle. [05]
- (C) Describe the two types of rotor construction of three phase Induction motor. [05]

**OR**

- (C) The 3000/200 V, 50 Hz, single phase transformer is built on a core having an effective cross sectional area of  $150 \text{ cm}^2$  and has 80 turns in the low voltage winding. Calculate (a) the value of the max. flux density in core, (b) the number of turns in the high voltage winding. [05]

**Q-5 Answer the following question.**

- (A) Explain the speed torque characteristic of a 3-phase induction motor with necessary diagram. [05]
- (B) Derive the equation of torque under running condition for three phase induction motor. [05]

**OR**

- (A) Explain different methods to control speed of three phase induction motor. [05]
- (B) Write a short note on Synchronizing procedure of A.C Generator with system. [05]

**Q-6 Answer the following question.**

- (A) Explain construction and type of A.C. Generator. [05]
- (B) Derive EMF equation of A.C. Generator. [05]

**OR**

- (A) Explain different types of single phase induction motor. [05]
- (B) Give comparison between Rotating & Pulsating magnetic field. [05]

**All the Best**

# KADI SARVA VISHWAVIDHYALAYA

## B.E. Semester III

Subject Code: EC-305

Subject Name:-Electrical Machines

Date: 7/12/2015

Time: 10:30 am to 1:30 pm

Total Marks:-70

**Instructions:**

1. Answer each section in separate Answer sheet.
2. Use of scientific calculator is permitted.
3. All questions are **compulsory**.
4. Indicate **clearly**, the options you attempt along with its respective Question number.
5. Use the last page of main supplementary of **rough work**.

### Section-I

**Q:1 (All compulsory)**

- (A) Draw a neat sketch of a D.C.machine with label, Describe its different parts their material and functions. [05]
- (B) Explain characteristic of DC shunt generator. [05]
- (C) State application of DC series, Shunt & compound generator. [05]

**OR**

- (C) Explain characteristics of DC compound generator. [05]

**Q-2 Answer the following question.**

- (A) Explain the basic principle of D.C.motor. Derive its torque equation. [05]
- (B) Calculate the voltage induced in the armature winding of a 4-pole, wave wound dc machine having 626 conductors and running at 1400 rpm. The flux per pole is 45mWb.

**OR**

- (A) Explain briefly how speed control is achieved for DC shunt motors ? [05]
- (B) What is necessity of starter for dc motor? Explain three point starter. [05]

**Q-3 Answer the following question.**

- (A) Draw the characteristic curves and state two applications for (i) a D.C shunt motor (ii) a D.C series motor. [05]
- (B) Give classification of induction motor based on principle of operation. [05]

**OR**

- (A) Explain the speed torque characteristic of a 3-phaseinduction motor with necessary diagram. [05]
- (B) Derive the equation of torque under running condition for three phase induction motor. [05]

## Section-II

**Q-4 (All compulsory)**

- (A) Explain different methods to control speed of three phase induction motor. [05]
- (B) Explain how does the rotor of induction motor rotate? Explain slip of induction motor. [05]
- (C) Explain different types of single phase induction motor. [05]

**OR**

- (C) Explain various types of losses occurring in induction motor. [05]

**Q-5 Answer the following question.**

- (A) Give comparison between Rotating & Pulsating magnetic field. [05]
- (B) Derive EMF equation of A.C. Generator. [05]

**OR**

- (A) Explain the working of a single phase transformer. [05]
- (B) The no load current of a transformer is 7 A at 0.3 power factor when supplied at 230 V, 50 Hz. The number of turns on the primary winding is 200. Calculate  
a) the maximum value of flux in the core, b) the core loss, and  
c) demagnetizing current.

**Q-6 Answer the following question.**

- (A) Define transformer and derive EMF equation for single phase transformer. [05]
- (B) Explain various types of losses occurring in a transformer. [05]

**OR**

- (A) Explain the construction of a three phase transformer from the view point of its working principle. [05]
- (B) Explain On-load operation of transformer with phasor diagrams. Neglect winding resistance and leakage reactance. [05]

**All the Best**