Reg. No. | | | | | | | | | | | | |

31-5-16-AN

Question Paper Code : 57324

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Electrical and Electronics Engineering

EE6504 – ELECTRICAL MACHINES – II

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. How can you distinguish between the two types of large synchronous generator from their appearance ?
2. Define voltage regulation.
3. List the inherent disadvantages of synchronous motor.
4. How can we change the operating speed of synchronous motor ?
5. Why are the slots on the cage rotor of induction motor usually skewed ?
6. Write down the condition to get maximum torque under running condition.
7. What is the effect of change in input voltage on starting torque of induction motor ?
8. How can the direction of a capacitor run motor be reversed ?
9. Name the motor being used in ceiling fans.
10. Why single phase induction motor is not self starting ? Mention any one method of starting.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Explain the concept of armature reaction and mention the methods to reduce this effect. (8)

(ii) In a 50-KVA, Y-connected, 440-V, 3-phase, 50 Hz alternator, the effective armature resistance is 0.25 Ω / phase. The synchronous reactance is 3.2 Ω/ phase and leakage reactance is 0.5 Ω / phase. Determine at rated load at unity power factor : (a) Internal e.m.f E_a, (b) no-load e.m.f, E_0, (c) percentage regulation on full load, (d) value of synchronous reactance which replaces armature reaction. (8)

OR

(b) The following data were obtained for the OCC of a 10 MVA, 13 KV, 3-phase, 50 Hz, Y-connected synchronous generator.

Field current (A) :	50	75	100	125	150	162.5	200	250	300
O.C. Voltage (KV) :	6.2	8.7	10.5	11.8	12.8	13.2	14.2	15.2	15.9

An excitation of 100 A causes the full-load current to flow during the short-circuit test. The excitation required to give the rated current at zero pf and rated voltage is 290 A.

(i) Calculate the adjusted synchronous reactance of the machine.

(ii) Calculate the leakage reactance of the machine assuming the resistance to be negligible.

(iii) Determine the excitation required when the machine supplies full-load at 0.8 pf lagging by using the leakage reactance and drawing the mmf phasor diagram. What is the voltage regulation of the machine ? Also calculate the voltage regulation for this loading using the adjusted synchronous reactance. Compare and comment upon the two results. (16)

12. (a) (i) Explain in detail V and inverted V curves of a synchronous motor. (8)

(ii) Explain in detail the method of starting of synchronous motor. (8)

OR

(b) (i) A 3300 V, delta connected motor has a synchronous reactance per phase of 18 Ω. It operates at a leading power factor of 0.707 when drawing 800 KW from the mains. Calculate its excitation emf. (8)

(ii) Enumerate in detail the effect of varying excitation on armature current and power factor of synchronous motor. (8)

13. (a) (i) Derive the expression for torque, slip and draw speed-torque characteristics of 3-phase induction motor. (8)

(ii) Explain in detail the construction of circle diagram of an induction motor. (8)

OR

(b) (i) Explain in detail the equivalent circuit of 3-phase induction motor. (8)

(ii) A 40 kW, 3-phase, slip-ring induction motor of negligible stator impedance runs at a speed of 0.96 times synchronous speed at rated torque. The slip at maximum torque is four times the full-load value. If the rotor resistance of the motor is increased by 5 times, determine :

(a) The speed, power output and rotor copper loss at rated torque.

(b) The speed corresponding to maximum torque. (8)

14. (a) (i) Explain in detail the speed control methods of induction motor. (8)

(ii) Explain in detail the scherbius system of speed control. (8)

OR

(b) (i) Describe a starter available for a 3-phase slip ring induction motor. (8)

(ii) A small squirrel-cage induction motor has a starting current of six times the full load current and a full-load slip of 0.05. Find in pu of full-load values, the current (line) and starting torque with the following methods of starting ((a) to (d)). (a) Direct switching, (b) Stator-resistance starting with motor current limited to 2p.u, (c) auto-transformer starting with motor current limited to 2p.u, and (d) Y-delta starting. (e) What auto transformer ratio would give 1pu starting torque ? (8)

15. (a) (i) Explain in detail the operation of capacitor start and run induction motor. (8)

(ii) Discuss in detail the operation of hysteresis motor. (8)

OR

(b) Write short notes on the following :

(i) Linear Induction motor and (8)

(ii) AC series motor (8)

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19/05/17 AN

Question Paper Code : 71779

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fifth Semester

Electrical and Electronics Engineering

EE 6504 — ELECTRICAL MACHINES — II

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What do you mean by single layer and double layer winding?
2. Define voltage regulation.
3. What are V – curves?
4. What is synchronous condenser?
5. Why are the slots on the cage rotor of induction motor usually skewed?
6. A 3-phase, 4-pole induction motor operates from a supply whose frequency is 50Hz. Calculate the frequency of the rotor current at standstill and the speed at which the magnetic field of the stator is rotating.
7. What is the effect of change in input voltage on starting torque of induction motor?
8. State two advantages of speed control of induction motor by injecting an e.m.f in the rotor circuit.
9. Define double field revolving theory.
10. Why single phase induction motor is not self starting? Mention any one method of starting.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain step by step method of potier triangle method of determining the regulation of an alternator. (8)

(ii) A 30MVA, 15KV, 60Hz ac generator has a synchronous reactance of 1.2pu and a resistance of 0.02 pu. Calculate

(1) the base voltage, base power and base impedance of the generator,

(2) the actual value of the synchronous reactance,

(3) the actual winding resistance, per phase

(4) the total full-load copper losses. (8)

Or

(b) A 3 phase Y-connected, 1000 KVA, 2000 V, 50 Hz alternator gave the following open-circuit and short circuit test readings :

Field current (A) :	10	20	25	30	40	50
O.C. Voltage (V) :	800	1500	1760	2000	2350	2600
S.C. armature current (A) :	–	200	250	300	–	–

The armature effective resistance per phase is 0.2Ω. Draw the characteristic curves and determine the full load percentage regulation at

(i) 0.8 p.f lagging,

(ii) 0.8 p.f leading by MMF method. (16)

12. (a) (i) Explain V – curve and inverted V curve. (8)

(ii) A 500 hp, 720 rpm synchronous motor connected to a 3980V, 3phase line generates an excitation voltage E_o of 1790V (line to neutral) when the dc exciting current is 25A. The synchronous reactance is 22Ω and the torque angle between E_o and E is 30°, calculate

(1) The value of E_x

(2) The ac line current

(3) The power factor of the motor

(4) The approximate horsepower developed by the motor

(5) The approximate torque developed at the shaft. (8)

Or

(b) (i) A 1000 KVA, 11000 V, 3–phase star-connected synchronous motor has an armature resistance and reactance per phase of 3.5Ω and 40Ω respectively. Determine the induced emf and angular retardation of the rotor when fully loaded at 0.8 p.f. lagging and 0.8 p.f. leading. (8)

(ii) Derive the expression for power delivered by a synchronous motor in terms of load angle (α). (8)

13. (a) Explain in detail the construction of circle diagram of an induction motor. (16)

Or

(b) (i) Sketch and explain the torque slip characteristics of the 3 phase cage and slip-ring induction motors. Show the stable region in the graph. (8)

(ii) A 3 phase, 25 KW, 400 V, 50 Hz, 8-pole induction motor has rotor resistance of 0.08 ohm and standstill resistance of 0.4 ohm. The effective stator/ rotor turn ratio is 2.5/1. The motor is to drive a constant-torque load of 250N-m. Neglect stator impedance

(1) Calculate the minimum resistance to be added in rotor circuit for the motor to start up on load.

(2) At what speed would the motor run, if the added rotor resistance is (A) left in the circuit, and (B) subsequently short circuited. (8)

14. (a) The results of the no-load and blocked rotor tests on a 3-phase, Y-connected 10KW, 400V, 17A, 50Hz, 8-pole induction motor with a squirrel-cage rotor are given below.

No- load test :	Line-line voltage	=	400V
	Total input power	=	467W
	Line current	=	6.8A
Blocked rotor tests :	Line-line voltage	=	180V
	Total input power	=	1200W
	Line current	=	17A

The dc resistance of the stator measured immediately after the blocked rotor test is found to have an average value of 0.68 ohm/phase. Calculate the parameters of the circuit model of the induction motor. Draw circuit model. Calculate

(i) Torque (net),

(ii) Stator current,

(iii) Power factor,

(iv) Efficiency. (16)

Or

(b) Explain the speed control of 3 phase induction motor with slip power recovery scheme. (16)

15. (a) Using double field revolving theory, explain why a single phase induction motor is not self starting. Also obtain the equivalent circuit of single phase induction motor with necessary equations. (16)

Or

(b) Describe the constructional features and principle of operation of hysteresis motor and AC series motor. (16)

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Reg. No. :

14/05/18

Question Paper Code : 41006

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Fifth Semester
Electrical and Electronics Engineering
EE6504 – ELECTRICAL MACHINES – II
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Two reaction theory is applied only to salient pole machines. State the reason.
2. What are the advantages of salient pole type construction used for Synchronous machines ?
3. How the synchronous motor can be used as synchronous condenser ?
4. How does a change of excitation affect its power factor ?
5. Why an induction motor will never run at its synchronous speed ?
6. Explain why an induction motor, at no-load, operates at very low power factor.
7. What is the need of starter for induction motor ?
8. What are the advantages of slip power scheme ?
9. What are the various methods available for making a single-phase motor self-starting ?
10. What is the principle of reluctance motor ?

PART – B (5×13=65 Marks)

11. a) Explain the procedure for POTIER method to calculate voltage regulation of alternator. (13)

(OR)

b) Describe the principle and construction of slow speed operation generator with neat diagram. (13)

12. a) A 5 kW, three-phase Y-connected 50 Hz, 440 V, cylindrical rotor synchronous motor operates at rated condition with 0.8 pf leading . The motor efficiency excluding field and stator losses is 95% and Xs = 2.5 Ω. Calculate :

i) Mechanical power developed

ii) Armature current

iii) Back emf

iv) Power angle

v) Maximum or pull out torque of the motor. (13)

(OR)

b) Explain the working of synchronous motor with different excitations. (13)

13. a) Explain the construction and working of three phase induction motor. (13)

(OR)

b) Develop an equivalent circuit for three phase induction motor. State the difference between exact and approximate equivalent circuit. (13)

14. a) Explain with neat diagram, the working of any two types of starters used for squirrel cage type three phase induction motor. (13)

(OR)

b) Explain briefly the various speed control schemes of induction motor. (13)

15. a) Give the classification of single phase motors. Explain any two types of single phase induction motor. (13)

(OR)

b) What is the principle and working of hysteresis motor and AC series motor ? Explain briefly. (13)

PART – C (1×15=15 Marks)

16. a) A 415 V, 11kW , 50 Hz, delta connected, three-phase energy efficient induction motor gave the following test results :

No load test : 415 V; 5.8 A; 488 W

Blocked rotor test : 40 V; 18.4 A; 510 W

Stator resistance per phase = 0.7 Ω.

For full-load condition, find

i) line current

ii) power factor

iii) input power

iv) slip and

v) efficiency.

(OR)

b) A 1.1 MVA, 2.2 kV, 3-phase, star -connected alternator gave the following test result during OC and SC tests :

Field current (A)	:	10	20	30	40	50
Open circuit voltage(kV)	:	0.88	1.65	2.20	2.585	2.86
Short circuit current (A)	:	200	400	–	–	–

The effective resistance of the 3-phase winding is 0.22 Ω/ph. Estimate the full-load voltage regulation at 0.8 p.f. lagging

i) By synchronous impedance method and

ii) Ampere-turn method.

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(b) The circuit model parameters in Ω/phase (referred to stator) of a 2 – phase, 1 kW, 220 V, 4–pole, 50 Hz squirrel– cage motor are given below:

$R_1 = 3\ W \quad R_2 = 2.6\ W \quad X_1 = X2 = 2.7\ W \quad X = 110\ W$

The windage, friction and core losses equal 200 W. The applied voltages are adjusted such that $Va = 110 - \underline{|90°}$ and $Vm = 220 - \underline{|0°}$

(i) Calculate the starting torque and starting current (in each phase).

(ii) Calculate the motor performance at s = 0.04.

(iii) With the motor running at s = 0.04, the phase a gets open–circuited What voltage will be developed across this phase?

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Question Paper Code : 52959

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fifth Semester

Electrical and Electronics Engineering

EE 6504 — ELECTRICAL MACHINES – II

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a distributed winding and what is meant by distribution factor?

2. What are the factors affecting the synchronous generator terminal voltage?

3. How can the speed of an synchronous motor be varied?

4. What is a damper winding? What is the function of it and where it is located?

5. What is meant by standstill reactance of induction motor's rotor? How does it vary with speed?

6. Write the expression for the resistance in the circuit model, the loss in which is equivalent to the mechanical power developed.

7. What are the methods used in starting squirrel cage induction motor?

8. Compare and contrast the speed control features of induction motor with DC shunt motor.

9. What is the advantage of a capacitor start motor over a resistance split phase motor?

10. Give reasons for the low efficiency of hysteresis and reluctance motors.

PART B — (5 × 13 = 65 marks)

11. (a) Draw the open-circuit and short-circuit characteristics using the data given below for a 150 MW, 13 kV, 0.85 pf, 50 Hz synchronous generator.

Open – circuit characteristic

I_f(A)	200	450	600	850	1200
Voc (line) (kv)	4	8.7	10.8	13.3	15.4

Short – circuit characteristic I_f = 750 A, I_{SC} = 8000 A

(i) Determine the unsaturated synchronous reactance of the machine.

(ii) Determine the saturated synchronous reactance of the machine.

Or

(b) Describe with neat sketch,

(i) The basic principle of operation of three phase alternator

(ii) Advantages of having stationary armature

(iii) Details of construction with types of rotor.

12. (a) Draw the power flow diagram, equivalent circuit of a synchronous motor and derive the expressions for power developed by a synchronous motor.

Or

(b) A 1000 kVA, 11 kV, 3ph star connected synchronous motor has an armature resistance and reactance per phase of 3.5 and 40 respectively. Determine the induced emf and angular retardation of the rotor when fully loaded at

(i) Unity p.f,

(ii) 0.8 p.f, lagging,

(iii) 0.8 p.f, leading

13. (a) A 6–pole, 50 Hz, 3–phase induction motor running on full load develops a useful torque of 160 Nm when the rotor emf makes 120 complete cycles per minute. Calculate the shaft power output. If the mechanical torque lost in friction and that for core–loss is 10 Nm. Calculate :

(i) the copper-loss in the rotor windings,

(ii) the input to the motor, and

(iii) the efficiency

The total stator loss is given to be 800 W.

Or

(b) A 400 V, 3–phase, 6–pole, 50 Hz induction motor give the following test results:

No–load 400 V 8 V 0.16 power factor

Blocked–rotor 200 V 39 A 0.36 power factor

Determine the mechanical output, torque and slip when the motor draws a current of 30 A from the mains. Assume the stator and rotor copper losses to be equal. Use circle diagram method.

14. (a) Describe, various methods of starting of 3 phase squirrel cage induction motors.

Or

(b) A 150 kW, 3000 V, 50 Hz, 6–pole star–connected induction motor has a star–connected slip–ring rotor with a transformation ratio of 3.6 (stator/rotor). The rotor resistance is 0.1 W/phase and its per phase leakage inductance is 3.61 mH. The stator impedance may be neglected. Find :

(i) the starting current and torque on rated voltage with short-circuited slip–rings and

(ii) the necessary external resistance to reduce the rated–voltage starting current to 30 A and the corresponding starting torque.

15. (a) Develop the circuit model of a single–winding (referred to as the main winding), single–phase motor on semi–quantitative basis.

Or

(b) Derive the expressions for main field EMF, cross field EMF with circuit model and phasor diagram of AC series motor.

PART C — (1 × 15 = 15 marks)

16. (a) A (0.5) kW, 4–pole, 50 Hz, 220 V, two–value capacitor motor has the following circuit model parameters:

R_{1m} = 4.2 W, X_{1m} = 11.3 W R_{1a} = 5.16 W, X_{1a} = 12.1 W

X = 250 W, a = 1.05 W R_2 = 7.48 W, X_2 = 7.2 W

Friction, windage and core losses = 45 W

(i) Calculate the starting torque and current if the two capacitors in parallel equal to 70 mF.

(ii) Calculate the value of the run capacitor for zero backward field when the motor is running at a slip of 0.04. What is the meaning of the associated resistance value?

(iii) Calculate the motor performance for the value of the run capacitor as in part (ii). Assume R_C = 0.

Or

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80380

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Electrical and Electronics Engineering

EE 6504 — ELECTRICAL MACHINES — II

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between full-pitch coil and short-pitch coil.
2. What are the conditions of parallel operation of alternators?
3. What are the various functions of damper winding provided with synchronous motor?
4. What is meant by hunting?
5. How can the direction of rotation of 3 phase induction motor be reversed?
6. What is the advantages of skewing the rotor slots?
7. Why is a starter needed for starting a large capacity induction motor?
8. What are the starting methods of three phase induction motor?
9. State the application of shaded pole motor.
10. Define the term step angle in a stepper motor.

PART B — (5 × 16 = 80 marks)

11. (a) List the methods used to predetermine the voltage regulation of synchronous machine and explain the MMF method. (16)

Or

(b) (i) Describe with neat sketches, the constructional details of a salient pole type alternator. (10)

(ii) Derive the emf equation of an Alternator. (6)

12. (a) Explain about the starting methods of synchronous motor. (16)

Or

(b) Draw the V-and inverted V-curves and explain the effect of excitation on armature current and power factor of synchronous motor. (16)

13. (a) (i) Develop the approximate equivalent circuit of a 3 phase induction motor. (8)

(ii) Draw and explain the torque-Slip characteristics of a 3 phase induction motor. (8)

Or

(b) (i) Explain the operation of Induction machine as a generator with neat diagram. (8)

(ii) Explain the speed torque characteristics of double cage induction motor with a neat diagram. (8)

14. (a) Explain the speed control methods of a three phase induction motor. (16)

Or

(b) With neat diagrams, explain the working of (i) Star-Delta Starter (ii) Auto Transformer Starter for 3 phase induction motor. (16)

15. (a) (i) Explain the operation of a single phase induction motor using double field revolving theory. (8)

(ii) Discuss with neat diagram the operation of shaded pole IM. (8)

Or

(b) Explain the construction and working principle of

(i) A.C. Series motor. (8)

(ii) Hysteresis motor. (8)

08/11/17 -FN

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50488

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fifth Semester

Electrical and Electronics Engineering

EE 6504 – ELECTRICAL MACHINES – II

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What is the necessity of chording in the armature winding of a synchronous machine ?
2. Distinguish between transient and sub-transient reactances.
3. A 3-phase synchronous motor driving a constant load torque draws power from infinite bus at leading power factor. How power angle and power factor will change if the excitation is increased ?
4. What is the role of damper winding in synchronous motor ?
5. What measure can be taken for minimizing the effect of crawling in a 3-phase induction motor ?
6. Draw the torque-slip characteristic of double-cage induction motor.
7. Why is rotor rheostat starter unsuited for a squirrel cage motor ?
8. What are the conditions for regenerative braking of an induction motor to be possible ?
9. How is the direction of rotation of a single phase induction motor reversed ?
10. What is the principle of operation of a linear induction motor ?

PART – B (5×13=65 Marks)

11. a) i) Derive the EMF equation of a 3-phase synchronous machine. (6)

ii) Describe how the direct and quadrature-axis reactances of a salient-pole synchronous machine can be estimated by means of slip test. (7)

(OR)

b) i) What is meant by Synchronizing ? State the conditions for paralleling alternator with infinite busbars. (5)

ii) Explain the Ampere-Turn method of finding voltage regulation of an alternator. (8)

12. a) i) Describe the principle of operation of synchronous motor. (5)

ii) What are the methods of starting a synchronous motor ? Explain any one of them with a circuit diagram. (8)

(OR)

b) i) What are 'constant excitation circles and constant power circle' for a synchronous motor ? How are they derived ? (8)

ii) Explain briefly how a synchronous motor can be operated as a synchronous condenser. (5)

13. a) i) Describe the working principle of a 3-phase induction motor. (7)

ii) An induction motor has an efficiency of 0.9 when the shaft load is 45 kW. At this load, stator ohmic loss and rotor ohmic loss each is equal to the iron loss. The mechanical loss is one-third of the no-load losses. Neglect ohmic losses at no-load. Calculate the slip. (6)

(OR)

b) i) Derive the expression for torque under running condition of a 3-phase induction motor and obtain the condition for maximum torque. (8)

ii) Write short notes on 'Induction generators'. (5)

14. a) i) With a neat diagram, explain the working of a star-delta starter for a 3-phase induction motor. (8)

ii) Describe the method of speed control of a 3-phase squirrel cage induction motor by changing the number of stator poles and state the applications of this method. (5)

(OR)

b) i) Draw and explain the schematic diagram of a static Kramer variable-speed drive system for a slip ring induction motor. (7)

ii) Explain the dc dynamic braking of a 3-phase induction motor. (6)

15. a) i) Explain the two field revolving theory for single phase induction motors. (8)

ii) Describe the principle of operation of Hysteresis motor. (5)

(OR)

b) i) Explain the no-load and blocked rotor tests on a single phase induction motor. (7)

ii) Describe the working principle of any one type of stepper motor. (6)

PART – C (1×15=15 Marks)

16. a) Explain the V/F control technique in 3ϕ IM. (15)

(OR)

b) With neat diagram, explain the construction and operation of shaded pole induction motor. (15)

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20461

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fifth Semester

Electrical and Electronics Engineering

EE 6504 — ELECTRICAL MACHINES II

(Regulations 2013)

(Common to PTEE 6504 – Electrical Machines II for B.E. (Part-Time) – Fourth Semester – Electrical and Electronics Engineering – Regulations 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the equation for frequency of emf induced in an alternator.
2. Identify the type of synchronous generators that are used in hydroelectric plant.
3. Why a 3-phase synchronous motor will always run at synchronous speed?
4. Define synchronous condenser.
5. Classify the two types of 3-phase induction motor.
6. Define pullout torque.
7. Name the two windings of a single-phase induction motor.
8. Specify the use of single-phase induction motor.
9. Predict the type of motor that is used for ceiling fan.
10. What are the applications of linear induction motor?

PART B — (5 × 13 = 65 marks)

11. (a) Explain the operating principle of three-phase alternator.

Or

(b) Derive the equation of induced emf for an alternator.

12. (a) Explain V-curves and inverted V-curves.

Or

(b) Explain briefly the features and principle of operation of three-phase synchronous motor.

13. (a) Generate the slip-torque characteristics for a three-phase induction motor and explain.

Or

(b) A 3-Phase, 400 V induction motor gave the following test reading :

No-load: 400 V, 1250 W, 9 A, Short circuit: 150 V, 4 kW, 38 A

Draw the circle diagram. If the normal rating is 14.9 kW, find from the circle diagram, the full-load value of current, power factor and slip.

14. (a) Explain the concept of crawling and cogging of induction motor in detail.

Or

(b) Describe the constructional features and operating characteristics of single-phase shaded pole motor.

15. (a) Discriminate the construction and principle of working of stepper motor.

Or

(b) Explain the operation, characteristics and application of DC and AC servo motor.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Why voltage regulation value obtained using the MMF method is considered to be optimistic? (6)

(ii) A 400 V induction motor runs at a speed of 1440 rpm when supplied from a 50 Hz source. Find its speed at 30 Hz when the load torque is constant. The frequency is varied while maintaining the ratio (V/f) constant. (9)

Or

(b) A three-phase, 12-pole, 500 rpm, star connected alternator has 144 slots with 8 conductors per slots. The coils are full pitched and the flux per pole is 0.08 wb. Determine the phase and line EMF's. What will be the phase voltage if the coils are connected to form a balanced two-phase winding? (15)

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Reg. No. :

Question Paper Code : 91494

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Fifth Semester
Electrical and Electronics Engineering
EE 6504 – ELECTRICAL MACHINES – II
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What is meant by armature reaction in alternator ?
2. Which method of predetermining the voltage regulation is called optimistic method ? Why ?
3. Why a 3-phase synchronous motor will always run at synchronous speed ?
4. What is meant by 'constant power circle' for synchronous motor ?
5. What is synchronous induction motor ?
6. Define pullout torque.
7. Why is a starter needed for starting a large capacity induction motor ?
8. Define slip power.
9. State double field revolving theory.
10. Identify the category of motor used in ceiling fan.

PART – B (5×13=65 Marks)

11. a) Explain the operating principle of three-phase alternator and derive the emf equation. (13)

(OR)

b) i) Explain how the voltage regulation is predetermined using ZPF method. (7)

ii) Describe about slip test. (6)

12. a) i) Explain V curve and inverted V curve. (4)

ii) Explain different starting methods of synchronous motor. (9)

(OR)

b) i) A 1000 kVA, 11000 V, 3-phase star-connected synchronous motor has an armature resistance and reactance per phase of 3.5 Ω and 40 Ω respectively. Determine the induced emf and angular retardation of the rotor when fully loaded at 0.8 p.f. lagging and 0.8 p.f. leading. (6)

ii) Derive the expression for power delivered by a synchronous motor in terms of load angle (α). (7)

13. a) i) Derive the expression for developed torque in a 3-phase induction motor and find the condition for maximum torque. (8)

ii) Explain construction and working of double cage induction motor. (5)

(OR)

b) i) Develop the equivalent circuit of a 3-phase induction motor. (8)

ii) A 440 V, 3-phase, 50 Hz, 6-pole induction motor running at 960 rpm takes 50 kW at a certain load. The friction and windgage loss is 1.8 kW. The stator losses are 1.2 kW. Calculate the

1) The rotor copper loss,

2) The output from the rotor and

3) Efficiency of the motor. (5)

14. a) Explain the speed control of a 3 phase induction motor using V/f control. (13)

(OR)

b) Explain the speed control of 3 phase induction motor with slip power recovery scheme. (13)

15. a) i) Explain the operation of a single phase induction motor using double field revolving theory. (7)

ii) Discuss with neat diagram the operation of shaded pole IM. (6)

(OR)

b) Explain the construction and working principle of

i) A.C. Series motor (6)

ii) Hysteresis motor. (7)

PART – C (1×15=15 Marks)

16. a) Explain with a neat diagram and clear steps how to construct a circle diagram for a 3ϕ induction motor. Also enumerate the procedure involved in obtaining its performance. (15)

(OR)

b) i) Construct the phasor diagram of non-salient pole synchronous generator connected to infinite bus. (8)

ii) Discuss the construction and working of Repulsion motor. (7)

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