Reg. No.

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.

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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)**

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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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