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Code No: 134AX

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, February - 2024

ELECTRICAL MACHINES – II

(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define slip of an induction motor.	[2]
b)	List the applications of Induction motors.	[3]
c)	What is crawling?	[2]
d)	Comment on the variation of torque with respect to slip in three phase induction motor.	[3]
e)	Discuss the advantage of stationary armature in case of an alternator.	[2]
f)	Define i) pitch factor ii) distribution factor of an alternator.	[3]
g)	What is synchronous condenser?	[2]
h)	Why can't the synchronous motors self-start? Explain.	[3]
i)	What is Double Revolving Field Theory?	[2]
j)	Write the disadvantages of shaded pole motor.	[3]

PART – B

(50 Marks)

2.a) Describe with a suitable diagram the constructional features of squirrel-cage induction motor.

b) A three-phase, 50 Hz, 6-pole cage motor is running with a slip of 3%. Calculate:
i) the speed of the rotating field relative to the stator winding
ii) the motor speed
iii) the frequency of emf induced in the rotor
iv) the speed of rotation of rotor mmf relative to rotor winding
v) the speed of rotation of rotor mmf relative to stator winding. [5+5]

OR

3.a) Show that the voltage generated in the rotor circuit of a three-phase induction motor at any slip's' is equal to 's' times the voltage generated at standstill.

b) The resistance and stand-still reactance per phase of a 3-phase induction motor is 0.1 Ω and 0.4 Ω, respectively. If 100 V per phase is induced in the rotor circuit at the start, calculate rotor current and rotor p.f. (i) when the rotor is stationary and (ii) when running with a slip of 5%. [5+5]

4.a) Write briefly about the different starting methods for a 3-phase induction motor.

b) The power input to a 6 pole, 3 phase, 50 Hz induction motor is 42 kW, the speed is 970 rpm. The stator losses are 1.2 kW and the frictional and windage losses are 1.8 kW. Find slip, rotor copper losses, bhp and efficiency. [5+5]

OR

5.a) When no-load and blocked rotor tests were performed on a 3-phase, 400 V, 50 Hz, star connected induction motor, the following results were obtained:
No-load test: 400 V, 8.5 A, 1100 W
Blocked-rotor test: 180 V, 45 A, 5700 W
Draw the circle diagram and estimate the line current and power factor of the motor when operating at 4% slip. The stator resistance per phase is measured as 0.5 Ω.

b) Explain the principle of speed control of a 3-phase induction motor by *v/f* method and draw the corresponding torque-speed characteristics and discuss the applications and limitations of these methods. [5+5]

6.a) A 3- phase, 16- poles synchronous generator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03Wb and speed is 375 rpm. Calculate the line frequency and the induced emf per phase.

b) What is voltage regulation? Explain the M.M.F. method for the determination of voltage regulation of an alternator. [5+5]

OR

7.a) Explain the two-reaction theory of salient pole alternator and draw its phasor diagram for lagging p.f. load?

b) A 500 kVA, 1,100 V, 50 Hz star connected 3-phase alternator has armature resistance per phase of 0.1 Ω and synchronous reactance per phase of 1.5 Ω. Find its voltage for (i) 0.9 p.f. lag and (ii) 0.8 p.f. lead. Also find the voltage regulation in each case. [5+5]

8.a) State the condition necessary for paralleling alternator and describe one method of synchronizing.

b) Explain V- Curve and Inverted V- Curves of a synchronous motor. [5+5]

OR

9.a) Explain the working principle of 3-ϕ synchronous motor.

b) Explain in detail about various techniques to reduce hunting in a synchronous motor. [5+5]

10.a) Explain the constructional details and principle of operation of a split-phase induction motor.

b) Describe the construction and operation of shaded-pole motor. [5+5]

OR

11.a) Using double field revolving field theory explain the torque–slip characteristics of a single phase induction motor and prove that it cannot produce starting torque.

b) Describe a motor being used in ceiling fan with circuit phasor diagram and torque-speed curve. [5+5]

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