

II B. TECH II SEMESTER REGULAR EXAMINATIONS, JUNE - 2022
ELECTRICAL MACHINES-II
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours

Max. Marks: 70

Note: Answer ONE question from each unit (5 × 14 = 70 Marks)

UNIT-I

1. a) Develop the equivalent circuit of a polyphase induction motor. Explain how this equivalent circuit is similar to the transformer equivalent circuit? [7M]
- b) A 3-phase, 4-pole, 50 Hz, induction motor has a star connected wound rotor. The rotor emf is 50V between the slip rings at standstill. The rotor resistance and standstill reactance are 0.4Ω and 2.0Ω respectively. Calculate [7M]
- (i) Rotor current per phase at starting when slip rings are short circuited
 - (ii) Rotor current per phase at starting if 50Ω per phase resistance is connected between slip rings.
 - (iii) Rotor EMF when the motor is running at full load at 1440 rpm
 - (iv) Rotor current at full load
 - (v) Rotor power factor at full load

(OR)

2. a) Draw a power flow diagram of a three phase induction motor and explain all the stages? [7M]
- b) A 25 hp, 400 V, 50 Hz, 4-pole, star connected induction motor has the following impedances per phase in ohms referred to the stator side: $R_s=0.641$, $R_r=0.322$, $X_s=1.106$, $X_r=0.464$ and $X_m=26.30$. Rotational losses are assumed constant and are 1.1 kW and the core losses are assumed negligible. If the slip is 2.2% at rated voltage and frequency, find i) speed ii) stator current iii) power factor iv) output and input power and v) efficiency of motor. [7M]

UNIT-II

3. a) Explain the phenomena of cogging and crawling in three phase induction motor. [7M]
- b) Explain the principle of speed control of a 3-phase induction motor by V/f method and draw the corresponding torque-speed characteristics. [7M]

(OR)

4. a) Explain briefly about the tests to be conducted on three phase induction motor to get its equivalent circuit? [7M]
- b) A 400V, 40 H.P, 50 Hz, 4-pole delta connected induction motor give the following test data: No-load test : 400V, 20A, 1200W ; Blocked rotor test : 100V, 45A, 2800W. Draw the circle diagram and determine (i) full load line current and power factor (ii) maximum output power (iii) full-load rotor speed Assume stator and rotor C_u losses to be equal at stand still. [7M]

UNIT-III

5. a) Explain the constructional features and principle of operation of a capacitor start induction run motor. Draw the torque speed characteristics. [7M]
- b) Discuss the modifications necessary to operate a dc series motor satisfactorily on single phase ac supply. [7M]

(OR)

6. a) Explain about the double-revolving field theory for single phase induction motors. [7M]
- b) Explain the construction and working of a shaded pole motor. [7M]

UNIT-IV

7. a) Explain how the potier triangle can be drawn with the help of OCC and any two points on the ZPFC? What are the observations we can derive from the potier triangle? [7M]
- b) Explain the EMF method of determining the regulation of an alternator. [7M]

(OR)

8. a) What are the conditions to be satisfied before a 3 phase alternator is synchronized to the infinite bus bar? Describe any one method of synchronizing the alternator to the infinite bus? [7M]
- b) Two star-connected synchronous generators connected in parallel have an emf of 1200 V per phase share a common star-connected load impedance $(2+j1.0) \Omega$ /phase. The synchronous impedances of the machines are $Z_{S1} = 0.1+j2\Omega$ /phase and $Z_{S2} = (0.2+j3)\Omega$ /phase respectively. Determine the common terminal voltage, power outputs and no-load circulating current when two machines internal emfs have a phase divergence 5° . [7M]

UNIT-V

9. a) What is hunting and discuss briefly various causes for hunting? [7M]
- b) A 75KW, 400V, 4-pole, 3-phase, 50Hz, star connected synchronous motor has a resistance and synchronous reactance of 0.04Ω and 0.4Ω respectively. Compute for full load 0.8pf lead the open circuit EMF per phase and gross mechanical power developed. Assume an efficiency of 92.5%. [7M]

(OR)

10. a) Explain the construction of damper winding. With neat diagram & explain how damper winding prevents oscillations in synchronous motors? [7M]
- b) A 2000V, 3-phase, 4-pole, Y- connected synchronous motor runs at 1500rpm. The excitation is constant and corresponds to an open circuit voltage of 2000V. The resistance is negligible as compared to a reactance of 3Ω per phase. Determine the power input, power factor and torque developed for an armature current of 200A. [7M]

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