

II B. Tech II Semester Regular Examinations, August/ September - 2021

ELECTRICAL MACHINES - II

(Electrical and Electronics Engineering)

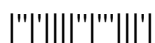
Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit

All Questions carry **Equal** Marks

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- 1 a) Discuss the points of similarities between a transformer and an induction machine. Hence, explain why an induction machine is called a generalized transformer. [8M]
- b) Show that the voltage generated in the rotor circuit of a 3-phase induction motor at any slip S is equal to S times the voltage generated at standstill. [7M]
- Or
- 2 a) Explain why the power factor of a 3-phase induction motor is low at no load and also under overloads. [6M]
- b) A 3- ϕ , 50Hz, 6- pole, 400V induction motor draws an input power to the rotor is 70kW. The motor emf is observed to make 120 cycles/minute. Calculate i) the slip, ii) rotor speed, iii) Mechanical power developed, iv) rotor resistance loss/phase and v) the rotor resistance/ phase, if the rotor current is 65A. [9M]
- 3 a) Compare the relative merits and demerits of cage rotor and wound rotor induction motors of the same power rating [7M]
- b) A 6-pole, 50Hz, 3- ϕ induction motor at what value of slip does the maximum torque obtain? and a motor has a full load slip of 0.04. The maximum torque is twice the full load torque. [8M]
- Or
- 4 a) Explain the speed control of induction motor with V/f control method. [6M]
- b) A 3- ϕ , 15.38 kW, 415V, 50Hz star connected Induction motor yielded the following data on testing. [9M]
- No load test : 415V 7.4A, $\cos \phi_0 = 0.25$
- Blocked rotor test: 220V 48A $\cos \phi_s = 0.42$
- From the circle diagram find i) line current, ii) Power factor and iii) Efficiency at rated load?
- 5 a) Explain the construction and working of a split phase single phase induction motor. [8M]
- b) Explain why a single-phase induction motor has zero starting torque. [7M]
- Or
- 6 a) Explain the principle of operation of single-phase induction motor based on "double revolving field theory". [7M]
- b) A 230 V, 50 Hz, 4-pole, single phase motor has the following equivalent circuit parameters: [8M]
- $R_1 = 2.2\Omega$, $X_1 = 3.1\Omega$ and $X_m = 80\Omega$
- $R'_2 = 4.4\Omega$, $X'_2 = 2.6\Omega$
- If the motor is running at 1450 rpm, calculate
- (i) Slip, (ii) input current, (iii) power factor, (iv) input power, (v) output power and (vi) efficiency.
- Assume the friction, windage and core losses to be 50W.



- 7 a) Give the Constructional details of rotor of both non-salient and salient pole synchronous machine. [7M]
b) What is armature reaction. Explain the effect of armature reaction on the terminal voltage of an alternator at different p.f conditions. [8M]
- Or
- 8 a) Explain the voltage regulation by synchronous impedance method of an alternator. [8M]
b) What do you mean by synchronizing of alternator? Describe any one method of synchronizing. [7M]
- 9 a) Explain the with neat sketches the principle of operation of a 3-phase synchronous motor. [8M]
b) The synchronous reactance per phase of a 3-phase, star connected 6600 V synchronous motor is 20 ohms. For a certain load the input is 900 kW at normal voltage and the induced line emf is 8500 V. Determine the line current and power factor. [7M]
- Or
- 10 a) Describe the effect of varying excitation on armature current and power factor in a synchronous motor. Draw V-Curve and state their significance. [7M]
b) State the characteristics features of a 3-phase synchronous motor. [4M]
c) Explain the applications of synchronous motor. [4M]

