

Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Electronics & Electrical Engineering)(Sem.-4)

ELECTRICAL MACHINES-II

Subject Code :BTEEE-402-18

M.Code :77575

Date of Examination : 05-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly :

- a) Why single phase induction motors are not self-starting?
- b) How can the rotation of a motor be reversed?
- c) Write down the possible reasons if a 3 phase induction motor fails to start.
- d) What is the usual cause of blow outs in induction motor?
- e) Why are induction motors referred to as asynchronous motors?
- f) Draw the power flow diagram for induction machine.
- g) Can a dc generator be converted into an alternator?
- h) Does change in excitation affect the synchronous motor speed?
- i) Mention some specific applications of synchronous machines.
- j) What is hunting?

SECTION-B

2. Show that emf generated in a short-pitched coil is reduced by factor $\cos(\epsilon/2)$, where ϵ is the chording angle.
3. A 3-phase 50 Hz induction motor, represented by the equivalent circuit constants $X_1 = X_2 = 0.1\Omega$ and $R_1 = R_2 = 0.02\Omega$ is to be operated at half its rated voltage and 25 Hz frequency. Calculate :
 - i) Maximum torque at this reduced voltage and frequency operation in terms of its normal value
 - ii) Starting torque at this reduced voltage and frequency operation in terms of its normal value.
4. A 3-phase star connected alternator has a rating of 810 kVA at 2.5 kV and has 12 poles. Rated speed is 500 rpm. There are three slots per pole per phase and number of conductors per slot is 5. For a full pitched winding, compute flux per pole to give rated terminal voltage at no load.
5. A 3-phase, 400V, 6-pole, 50 Hz, star connected wound rotor slip induction motor has a sum of stator and rotor leakage reactance referred to stator of 1 ohm. It is connected to a balanced 400V supply and drives a pure inertia load. The moment of inertia of rotor including the load is 10 kg-m^2 . DOL starting is used and the rotor circuit resistance is adjusted so that the motor brings its load from rest to 0.95 of synchronous speed. Neglecting losses excepting those of the resistance referred to the stator and rotor and the exciting current, calculate the value of the rotor resistance and the minimum time to reach 0.95 of synchronous speed.
6. What are the conditions for parallel operation of alternators?

SECTION-C

7. A 400 V, 3-phase mesh connected synchronous motor runs at rated voltage and with an excitation emf of 510 V. Its synchronous impedance per phase is $0.5 + j4$ ohm and friction, windage and iron losses are 900 W. Calculate the shaft power (net power) output, line current, pf, and efficiency for (a) maximum power output and (b) maximum power input.
8. A 220 V, 50 Hz, 6 pole star connected alternator with ohmic resistance of 0.06 ohm per phase, gave the following data for open circuit, short-circuit and full-load zero-power factor characteristics:

Field current (A)	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.80	2.20	2.60	3.00	3.40
Open Circuit voltage E_f (V)	29.0	58.0	87.0	116	146	172	194	232	261.5	284	300	310
Short Circuit Current I_{sc} (A)	6.6	13.2	20.0	26.5	32.4	40.0	46.3	59.0	-	-	-	-
Z.p.f. terminal voltage (V)	-	-	-	-	-	0	29	88	140	177	208	230

Find the percentage voltage regulation at full load current of 40 A at power factor of 0.8 lag by e.m.f. method.

- a. Repeat problem 1 by m.m.f. method.
- b. Repeat problem 1 by z.p.f. method.

9. A 230 V, 4 pole 50 Hz single phase induction motor has following constants and losses:

$r_1 = 2.3\Omega$, $r_2 = 4.2\Omega$, $x_1 = 3.2\Omega$, $x_2 = 3.2\Omega$, $X_m = 74\Omega$, core loss 98 watts, friction and windage loss = 30 watts. If this motor is running with a slip 0.05 at rated voltage and frequency, then compute the stator current, pf, power output, torque and efficiency with its auxiliary winding open.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.