

A.C. Machines Performance (315333)

MSBTE Diploma · K-Scheme · Model Question Paper — Set C

Time: 3 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) A 6 pole, 50 Hz, 3- ϕ induction motor runs at 960 rpm. Calculate its synchronous speed and slip.
- b) State any two reasons why a starter is necessary for a 3- ϕ induction motor.
- c) State any four applications of shaded pole induction motor.
- d) Write the e.m.f. equation of an alternator and state the meaning of each term.
- e) Define pull-out torque of a synchronous motor. What happens if the load exceeds it?
- f) State any two applications each of stepper motor and linear induction motor.
- g) State the conditions to be satisfied for synchronising an alternator with the bus-bars.

Q.2 Attempt any THREE of the following:**12**

- a) Describe the working of a soft starter using SCRs. State its advantages.
- b) Explain the working of an auto-transformer starter with a neat diagram.
- c) Explain speed control of a 3- ϕ induction motor by (i) pole changing and (ii) rotor resistance control.
- d) Draw the circuit diagram of a star–delta starter. Why can it be used only for motors designed to run in delta?

Q.3 Attempt any THREE of the following:**12**

- a) State double field revolving theory and explain it with a neat sketch of the rotating flux components.
- b) Explain the construction and working of a shaded pole induction motor with a neat sketch.

- c) Explain the working of a capacitor start capacitor run induction motor and draw its torque–speed characteristics.
- d) Compare resistance split-phase motor and capacitor start induction run motor (any four points).

Q.4 Attempt any THREE of the following:

12

- a) Explain how a rotating magnetic field of constant magnitude is produced when a 3- ϕ supply is given to a 3- ϕ stator winding.
- b) Draw the torque–slip characteristics of a 3- ϕ induction motor showing the effect of rotor resistance. Explain the stable and unstable regions.
- c) A single-stack, 3-phase variable reluctance stepper motor has 6 stator teeth and 4 rotor teeth. Find the step angle, the number of steps per revolution and the speed when the stepping rate is 250 pulses per second.
- d) Explain the construction and working of a synchronous reluctance motor.
- e) List the methods of slip measurement. Explain the tachometer method and the stroboscopic method.

Q.5 Attempt any TWO of the following:

12

- a) The power input to an 8 pole, 3- ϕ , 50 Hz induction motor is 36 kW and it runs at 720 rpm. Stator losses are 1.1 kW and friction and windage losses are 0.9 kW. Find: (i) slip (ii) rotor frequency (iii) rotor copper loss (iv) shaft output (v) efficiency.
- b) Explain the construction of a 3- ϕ alternator. Compare salient pole (hydro) and cylindrical rotor (turbo) alternators.
- c) A 6 pole, 50 Hz, 3- ϕ slip-ring induction motor has rotor resistance 0.04Ω and standstill reactance 0.24Ω per phase. The rotor e.m.f. per phase at standstill is 80 V and the full-load speed is 960 rpm. Calculate: (i) starting torque (ii) full-load torque (iii) maximum torque (iv) the extra rotor resistance per phase needed to get maximum torque at starting.

Q.6 Attempt any TWO of the following:

12

- a) A 1200 kVA, 6600 V, 3- ϕ , star-connected alternator has armature resistance 0.25Ω and synchronous reactance 5Ω per phase. It supplies a load of 960 kW. Calculate the percentage voltage regulation when the power factor is (i) 0.8 lagging (ii) unity.
- b) Explain the effect of armature reaction in an alternator at unity, zero lagging and zero leading power factor with phasor diagrams and flux waveforms.
- c) (i) Define pitch factor and distribution factor. (ii) A 3- ϕ , 10 pole, star-connected alternator runs at 600 rpm. It has 90 slots with 4 conductors per slot and the coil span is 8 slots. The flux per pole is 0.08 Wb, sinusoidally distributed. Calculate the phase and line e.m.f.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in

