

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E Sem-II Remedial Examination December 2010****Subject code: 720701****Subject Name: Advanced Electrical Machines****Date: 18 /12 /2010****Time: 02.30 pm – 05.00 pm****Total Marks: 60****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Determine the expressions for f_{qs} , f_{ds} and f_{0s} for a given set of three phase quantities: $f_{as} = -\cos t$, $f_{bs} = (2/3) t$, $f_{cs} = \sin t$. Evaluate expressions for $t = \pi/3$ sec with zero initial conditions. **06**

(b) Why the reactive power is required to wind mill generator? With suitable diagram illustrate the compensation of reactive power requirement of the wind mill generator. **06**

Q.2 (a) Explain the term vector rotator. Derive the expression of vector rotator. Explain its significance. **06**

(b) Explain the working principle of BLDC machine. Explain difference between BLDC machine and synchronous machine. **06**

OR

(b) Explain electromechanical energy conversion in SRM. **06**

Q.3 (a) Explain working principle of permanent magnet stepper motor. Find the step angle for a 3 phase, 4 pole stepper motor having two stator teeth in one tooth pitch of a stator tooth. **06**

(b) How linear induction machine is different than conventional induction machine? Explain usefulness and applications, where it preferred. **06**

OR

Q.3 (a) Explain in brief construction and working principle of hybrid stepper motor. Compare VR, permanent magnet and hybrid step motor characteristics based on step angle, phases, drive type and rotor inertia. **06**

(b) Explain the concept of energy efficient motor. Describe various efficiency evaluation techniques. **06**

Q.4 (a) Discuss essential elements in condition monitoring system. Explain the principle of hall effect devices and their benefits over other sensors. **06**

(b) Write short notes on modern discharge detection techniques used for the rotating electrical machines. **06**

OR

Q.4 (a) Explain significance of measuring shaft flux and shaft current in condition monitoring of rotating electrical machines. **06**

(b) Compare wind mill generator with synchronous generator. How constant voltage and frequency is achieved in the wind mill generator. **06**

Q.5 (a) Discuss typical root causes and failure modes of electrical machines. How condition monitoring can help in diagnosis of machine health. **06**

(b) Discuss block diagram of typical electromechanical system. Explain energy balance in such system. **06**

OR

Q.5 (a) Derive winding inductances and voltage equations for induction machine. Mention assumptions made for derivation. **06**

(b) Discuss the concept of discharge monitoring. Mention various category of discharge. Explain RF coupling method for the detection of early discharge. **06**
