

**KINGFAHD UNIVERSITY OF PETROLEUM & MINERALS**  
**Department of Electrical Engineering**

**Electromechanical Engineering**  
**EE 306 Final Examinations**

**January 20, 2008**  
**7:00 9:00 pm**

**Instructor: Dr. Z Al-Hamouz**

**Student Name:**

**ID#:**

<b>Question</b>	<b>Grade</b>
<b>1</b>	/
<b>2</b>	/
<b>3</b>	/
<b>4</b>	/
<b>5</b>	/
<b>6</b>	/
<b>7</b>	/
<b>8</b>	/
<b>9</b>	/

**Q1)** A six pole DC machine has an armature connected as a lap winding with a total number of conductors equal to 120. The armature is rotated at a speed of 600 rpm and the flux per pole is 30 mWb. Calculate the induced voltage.

**Q2)** A shunt connected generator has four poles. The armature and field resistances are 0.1 and 100 ohms, respectively. The generator supplies 3.5 kW to a load connected to its terminals at a voltage of 120 V. Calculate:

a) the terminal current

b) the field current

**Q3)** A 250 V shunt motor delivers 15 kW of power at the shaft at 1200 rpm while drawing a line current of 75 A. The field and armature resistances are 250 and 0.1 ohms, respectively. The armature induced voltage is 240.6 V. Calculate:

a) the developed torque

b) the motor efficiency

**Q4)** A 3-phase, 6-pole, 60 Hz, Y connected synchronous generator has a synchronous reactance of 7.5 ohms per phase and negligible armature resistance. The generator is connected to a 13.8 kV bus. It also delivers a real output power of 50 MW and a reactive power of 30 MVAR. Calculate the armature current.

**Q5)** A 3-phase, 6-pole, 60 Hz, 240 volt, Y connected synchronous generator has an armature current of 200.8 A with a 0.866 pf lagging. The synchronous impedance is  $0.1 + j 0.5$  ohms per phase. Determine:

a) The excitation voltage.

b) The power angle

**Q6)** A three phase, 10 MVA, 12 kV, 2-pole, 60 Hz, synchronous generator has the following data:

Open circuit core loss at 12 kV = 75 kW.

Short circuit load loss at 480 A = 60 kW.

Friction and windage = 65 kW

Compute the efficiency at rated load and 0.8 p.f. lagging.

**Q7)** A 3-phase induction motor is connected to a 3-phase 60-Hz source. At full load, the motor runs at 1140 rpm. Determine:

a) Number of poles.

b) Slip at full load

**Q8)** A three phase, 440 volt, 6-pole, 60 Hz, Y-connected induction motor has a stator impedance of  $1.0 + j 1.6$  ohms per phase. The rotor impedance referred to the stator is  $0.8 + j 1.4$  ohms per phase. Determine:

a) The slip at maximum (pullout) torque

b) The pullout torque

**Q9)** A 100 kVA, 2400/240 V, 60-Hz, single phase transformer has an open circuit losses of 1500 W at full load voltage and short circuit losses of 2000 W at full load current.

Find the efficiency of the transformer when supplying its half load at 0.8 pf.