Mid-West University

Examinations Management Office

Semester End Examinations 2081

Bachelor level/ B.E. Hydropower/ 5th Semester | Full Marks: 50

Time: 3 hours | Pass Marks: 25

Subject: Electromechanical Equipment (HE457)

- *Attempt all the questions*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

1. Compare Magnetic Circuit and Electric Circuit. And differentiate between Singly and doubly excited magnetic field system with diagram. **[5]**
2. A coil has 500 turns and is uniformly wound on an iron ring of mean circumference 50 cm and cross-sectional area $4cm^2$. It carries a current of 1.2 Amp. Relative permeability is 500. Calculate the values of; **[4]**
   a) MMF
   b) Magnetizing force
   c) Total flux in the iron
   d) Reluctance
3. What is the flux density in a magnetic field of cross-sectional area 20 cm^2 having a flux of 3 mWb? **[2]**
4. Explain the different characteristics (curves) of DC generators. **[5]**
5. A 4-pole lap-connected armature of DC shunt generator is required to supply the loads connected in parallel:
   1. 5 kW Geyser at 250 V and
   2. 2.5 kW Lighting load at 250 V

   The Generator has an armature resistance of 0.2 ohm and a field resistance of 250 ohm. The armature has 120 conductors in the slots and runs at 1000 rpm. Allowing 1 V per brush for contact drops and neglecting friction, find
   a) Flux per pole **[3]**
   b) Armature-current per parallel path. **[1]**
6. A shunt generator delivers 450 A at 230 V and the resistance of the shunt field and armature are 50 ohm and 0.03 ohm respectively. Calculate the generated emf. **[2]**
7. A DC motor takes an armature current of 110 A at 480 V. The armature circuit resistance is 0.2 ohm. The machine has 6-pole and the armature is lap-connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate the speed and gross torque developed by the armature. **[3]**
8. 3-phase, 16-pole alternator have a star-connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb, sinusoidally distributed and the speed is 500 rpm. Find the frequency rpm and the phase and line emf. Assume full-pitched coil. **[3]**
9. Calculate the distribution factor for a 36-slots, 4 pole, single-layer three-phase winding. **[2]**
10. Explain the working principle of three phase synchronous generators. **[5]**
11. What are the different power stages of three phase induction generator also explain the voltage buildup process in induction generator? **[5]**
12. Describe the double-field revolving theory with diagram. **[5]**
13. Explain the different types of Split phase induction motor. **[5]**

The End