Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
Mid Term Examination, Summer – 2026

Course Code: 0713-223 | Course Title: Energy Conversion II
Section: A, B, C, D | Level-Term: L2-T2 | Teacher's Initial: NR, RS
Full Marks: 25 | Exam Date: June 27, 2026 | Time: 1.5 Hours

Notes: Answer all the questions below. The second right most column indicates the course outcomes (COs) with respective Bloom's level and the right most column indicates the allocated marks.

Q1.	**Draw** and **explain** the complete brushless excitation system of a synchronous generator that includes a pilot exciter with the function of each component.	CO-1 C(2)	5
Q2.	**Analyze** the effect of load changes on a synchronous generator for lagging, unity, and leading power factor loads using phasor diagram.	CO-2 C(4)	5
Q3.	A 100 kVA, 3000 V, 50 Hz, 3-phase star-connected alternator has an armature resistance of 0.2 Ω per phase. A field current of 40 A produces a short-circuit current of 200 A and an open-circuit line voltage of 1040 V. **Analyze** how the power factor affects the voltage regulation by determining the full-load voltage regulations and drawing the corresponding phasor diagrams of the alternator at 0.8 power factor lagging and 0.8 power factor leading.	CO-2 C(4)	5
Q4.	A 480-V, 50-Hz, Y -connected, six-pole synchronous generator has a per-phase synchronous reactance of 1.0 Ω. Its full-load armature current is 60 A at 0.8 PF lagging. This generator has friction and windage losses of 1.5 kW and core losses of 1.0 kW at 60 Hz at full load. The armature resistance is negligible and the field current has been adjusted so that the terminal voltage is 480 V at no load. (i) **Determine** the speed of rotation of this generator. (ii) **Evaluate** the terminal voltage of this generator if the following are true, 1. It is loaded with the rated current at 0.8 PF lagging. 2. It is loaded with the rated current at 1.0 PF. 3. It is loaded with the rated current at 0.8 PF leading. (iii) **Calculate** the efficiency of this generator (ignoring the unknown electrical losses) when it is operating at the rated current and 0.8 PF lagging.	CO-3 C(5)	5

Q5. Two synchronous generators are operating in parallel supplying a total load of 2.5 MW at 0.8 power factor lagging. Generator 1 has a no-load frequency of 61.5 Hz and a slope of 1 MW/Hz, while Generator 2 has a no-load frequency of 61.0 Hz and a slope of 1 MW/Hz. After steady-state operation, an additional 1 MW load is connected and the governor set point of Generator 2 is increased by 0.5 Hz.
Evaluate the system frequency and the generator powers before and after the change in system condition.

CO-3 C(5) 5