Syllabus for the Written Test of PhD Admission of DESE, IIT Delhi (ESZ) for 2nd Sem of Academic year 2026-2027 (For CSIR/UGC NET category 2 and 3 candidates only)	
Topic 1	Fundamental concepts of energy conversion technologies: Different Energy Conversion pathways from primary energy to secondary energy: Direct Energy Conversion and Indirect Energy Conversion, Environmental considerations
Topic 2	Fossil energy resources: R/P ratio, estimation of reserves, unconventional fossil resources (coal bed methane, shale gas, gas hydrates, frozen methane), peak oil theory.
Topic 3	Nuclear energy resources: Energy-mass relation, nuclear reaction conservation laws, binding energy and Q-values, radioactive decay, fission and fusion.
Topic 4	Solar thermal systems: Solar radiation distribution and measurement, solar geometry, optical efficiency, thermal efficiency, energy conversation for solar thermal collectors, flat plate collectors, evacuated tube collectors, solar air heaters, concentrating collectors.
Topic 5	Solar photovoltaic (PV) systems: I-V characteristics, efficiency, fill factor, series and parallel connections, sizing of PV systems (load factor, days of autonomy, battery size, inverter size, PV array size), maximum power point tracking.
Topic 6	Biomass: Biomass resources, biomass composition, characterisation, conversion methods (pyrolysis, gasification, steam reforming), biofuels.
Topic 7	Wind energy conversion systems: Wind resource analysis, types and characteristics of wind turbines, Betz limit, wind turbine motor design considerations, blade profile, wind energy generators.
Topic 8	Hydropower: Hydro resources, hydro power plants, turbines (Pelton, Kaplan, Francis), small hydro systems.
Topic 9	Energy storage systems: Batteries (capacity, C-rate, state of charge, state of health, depth of discharge, energy and power densities); conservation of energy and mass for thermal energy storage, pumped hydro storage, and compressed air storage; charging, discharging, and round trip efficiency.
Topic 10	Types of electrical generators for different energy conversion technologies