B.Sc.TE (2Yr): 4th Semester
B.Sc. in EEE: 8th Semester

Date: 15 May, 2024
Time: 10:00am – 01:00pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Semester Final Examination
Course Number: EEE 4801/4895
Course Title: Power Generation

Summer Semester: 2022 - 2023
Full Marks: 150
Time: 180 Minutes

There are **06 (six)** questions. Answer **all** the questions. The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in the brackets.

1. a) Define a hydro-electric power station. Justify the site selection for a hydro-electric power station. **(12.5) (CO1) (PO1)**

   b) Calculate the average power in kW that can be generated in a hydro-electric project from the given data: catchment area = 5×10^9 m^2; mean head, H = 30 m; annual rainfall, F = 1·25 m; yield factor, K = 80%; and overall efficiency, $\eta_{overall}$ = 70 %. **(12.5) (CO2) (PO2)**

2. a) Define coefficient of performance for a wind machine. Differentiate the coefficient of performance from the capacity factor of the wind machine. **(12.5) (CO1) (PO1)**

   b) An industry wants to install a wind turbine to generate annual energy of 20000 kWh. The wind speed at the location is 5 m/s at a height of 15 m from the ground. Make necessary assumptions and estimate the rotor size and power rating of the turbine. **(12.5) (CO2) (PO2)**

3. a) Define and explain the importance of the daily load curve. **(12.5) (CO1) (PO1)**

   b) A generating station has a maximum demand of 25MW, a load factor of 60%, a plant capacity factor of 50% and a plant use factor of 72%. Find (i) the reserve capacity of the plant (ii) maximum energy that could have been produced daily if the plant running as per schedule, were fully loaded. **(12.5) (CO2) (PO2)**

4. a) Explain the Straight-line method of depreciation as applied to economics of power generation. **(12.5) (CO1) (PO1)**

   b) A factory has a maximum load of 240 kW at 0·8 p.f. lagging with an annual consumption of 50,000 units. The tariff is Tk 50 per kVA of maximum demand plus 10 paise per unit. i) Calculate the flat rate of energy consumption. ii) Find the annual saving if p.f. is raised to unity? **(12.5) (CO2) (PO2)**

5. a) Define tarrif and explain the desirable characteristics of a tariff. **(12.5) (CO1) (PO1)**

b) A generating station has given data: installed capacity = 300 MW; capacity factor = 50%; annual load factor = 60%; annual cost of fuel, oil etc. = Tk 9×10^7; capital cost = Tk 10^9; annual interest and depreciation = 10%. Calculate (i) the minimum reserve capacity of the station and (ii) the cost per kWh generated. **(12.5) (CO2) (PO2)**

6. a) Define power factor and discuss the disadvantages of low power factor. **(12.5) (CO1) (PO1)**

b) A factory operates at 0·8 p.f. lagging and has a monthly demand of 750 kVA. The monthly power rate is Tk 8·50 per kVA. To improve the power factor, 250 kVA capacitors are installed in which there is negligible power loss. The installed cost of equipment is Tk 20,000 and fixed charges are estimated at 10% per year. Calculate the annual saving effected by the use of capacitors. **(12.5) (CO2) (PO2)**