

University of Ruhuna - Faculty of Technology
Department of Engineering Technology
Level III (Semester I) Examination, July 2020

Course unit: ENT3112 Electrical Power Systems
Time Allowed two (02) hours

Answer all **Four (04)** questions. Calculators are allowed to use for calculations.

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Q 01.

- a) Explain renewable and non-renewable power sources with examples. (3 marks)
- b) What are the limitations of using solar energy as a renewable energy source? (4 marks)
- c) Briefly explain the working principle of a steam turbine power plant with the help of a block diagram. (10 marks)
- d) Write two advantages and two disadvantages of a steam turbine power plant, in comparison with a hydro power plant. (6 marks)
- e) In a steam power station having the maximum demand of 20 MW, the boiler efficiency and the turbine efficiency are 80% and 90% respectively. Calculate thermal efficiency of the power station. (2 marks)

Q 02.

- a) What is the most common earthing system used in Sri Lanka? Explain using diagram. (5 marks)
- b) What is the function and tripping mechanism of a Miniature circuit breaker (MCB) and a Residual Current Device (RCD)? (6 marks)
- c) What are the safety precautions needed in using electricity? (4 marks)
- d) A single-phase 230 V, 50 Hz, AC generator supplies the lighting loads, heating loads and induction motor loads and the total load is 200 kW with 0.75 power factor lagging.

Calculate the capacitance of capacitor bank to improve power factor from 0.75 lagging to 0.95 lagging.

(10 marks)

Q 03.

a) What are the key parameters that a supply company has to take into account when planning electricity tariff?

(3 marks)

b) Following are the rates applied to electricity supplies at each individual point of supply delivered and metered at 400/230 V nominal voltage and the contract demand exceeds 42 kVA.

Time Intervals	Energy Charge (LKR/kWh)	Fixed Charge (LKR/month)	Maximum Demand Charge per month (LKR/kVA)
Peak (18.30-22.30)	26.60	3000.00	1100.00
Day (5.30-18.30)	21.80		
Off-peak (22.30 – 5.30)	15.40		

Calculate the monthly bill for the customer for the following electricity consumption.

Time Intervals	Units
Peak (18.30-22.30)	540
Day (5.30-18.30)	330
Off-peak (22.30 – 5.30)	333
kVA	140

(4 marks)

c) A power station has a maximum demand of 100 MW and it supplies power through three transformers whose connected loads are 55, 35, 40 MW.

Daily load curve is defined as follows:

Time duration (hours)	00.00-06.00	06.00-08.00	08.00-12.00	12.00-15.00	15.00-18.00	18.00-22.00	22.00-24.00
Load (MW)	30	60	70	50	80	100	40

I. Draw the load curve and load duration curve for the given details.

(6 marks)

- II. Determine the load factor of the power station. (4 marks)
- III. Calculate demand factor. (4 marks)
- IV. Calculate annual energy production. (4 marks)

Q 04.

- a) What is the importance of future plan of energy sector? (3 marks)
- b) Briefly explain two power system future plans to be implemented within next 10 years. (6 marks)
- c) Briefly explain three key issues with planning and implementing new power plants in Sri Lanka. (6 marks)
- d) What is the purpose of an Environment Impact Assignment (EIA)? (5 marks)
- e) Briefly explain about the environmental effects of implementing a hydro power station. (5 marks)