

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

Mid-Semester Examination

Course No.: EEE 4625

Course Title: Utilization of Electrical Energy

Summer Semester, A. Y. 2021-2022

Time: 90 Minutes

Full Marks: 75

There are **3 (three)** questions. Answer all **3 (three)** questions. The symbols have their usual meanings. Programmable calculators are not allowed. Marks of each question and corresponding COs and POs are written in the brackets.

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1. a) Briefly describe the disadvantages of low power factor. **05**  
(CO1,  
PO1)
- b) The load on an installation is 650 KW, 0.75 lagging p.f. which works for 4000 hours per annum. The tariff is BDT 100 per kVA plus BDT 0.2 per kWh. If the power factor is improved to 0.9 lagging by means of loss-free capacitors costing BDT 70 per kVAR, calculate the annual savings affected. Allow 15% per annum for interest and depreciation on capacitors. **12**  
(CO3,  
PO3)
- c) A generating station has a maximum demand of 10 MW. Calculate the cost per unit generated from the following data: **08**  
(CO3,  
PO3)
- |                             |                 |
|-----------------------------|-----------------|
| Annual Load factor          | = 35%           |
| Capital cost                | = 12,50,000 BDT |
| Annual cost of fuel and oil | = 8,00,000 BDT  |
| Taxes, wages, and salaries  | = 7,00,000 BDT  |
| Interest and depreciation   | = 10%           |
2. a) Explain the terms load factor and diversity factor and how do these factors influence the cost of generation? **05**  
(CO2,  
PO2)
- b) Discuss the advantages of the interconnected grid system. **05**  
(CO1,  
PO1)
- c) A power station has to meet the following load demand: **15**  
(CO3,  
PO3)
- |         |  |
|---------|--|
| Load A: | 50 KW between 10 A.M. to 3 P.M and 30 KW between 7 P.M. to 10 P.M. |
| Load B: | 20 KW between 2 P.M. to 5 P.M. and 40 KW between 6 P.M. to 10 P.M. |
| Load C: | 60 KW between 4 P.M. to 6 P.M. and 10 KW between 10 P.M. to 5 A.M. |
- Sketch the daily load curve if the plant runs all the time and determine the following
- i) Maximum Demand on the station
  - ii) Diversity Factor
  - iii) Units generated per day
  - iv) Average Load
  - v) Load Factor

3. a) Briefly describe the commonly used tariff set by the electricity supply companies. **07**  
**(CO1, PO1)**
- b) Calculate the maximum overload that can be carried by a 30 KW output motor, if the temperature rise is not to exceed 50°C after one hour on overload. The temperature rise on full load, after 1 hour is 30°C and after 3 hours is 40°C. Assume losses proportional to square of the load. **10**  
**(CO3, PO3)**
- c) Derive the equation for heating of motor and show that the heating time constant is the time required to heat the motor up to 0.633 times its final temperature rise. **08**  
**(CO2, PO2)**