Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Dec 2019

Course: Electrical Utilities **Semester: I**
Program: M. Tech. - ES **Time 03 hrs.**
Course Code: EPEC 7015 **Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q 1	Estimate the percentage voltage unbalance if the measured voltages are as follows: Y_{RY} = 425, V_{YB} = 418, V_{BR} = 423	**4**	**CO1**
Q 2	Briefly describe advantages of installing a 'servo stabilizer' for lighting circuits.	**4**	**CO5**
Q 3	Discuss in brief on 'construction aspects' how an "energy efficient motor" is different from a "standard motor".	**4**	**CO3**
Q 4	Ice is formed at 0°C from water at 30 °C. In the refrigeration system, same temperature water is used for condenser cooling and the temperature of the brine is- 15°C at evaporator. Consider the system as ideal refrigeration; find the CoP of the refrigeration system.	**4**	**CO4**
Q 5	Briefly explain the functions of electronic ballast.	**4**	**CO5**

SECTION B

Q 6	Explain in detail the different components of tariff structure.	**10**	**CO1**
Q 7	A small-scale industry has a constant load of 380 kVA. It has installed two transformers of 500 kVA each. The no load loss and full load copper loss of each 500 kVA transformer is 750 W and 5410 W respectively. From the energy efficiency point of view the small scale industry management wants to take a decision on whether to operate a single transformer or two transformers equally sharing the load. Give recommendation based on your calculations.	**10**	**CO4**
Q 8a	Estimate the waste heat potential for a 1500 kVA DG set at 1000 kW loading and with 520 deg. C exhaust temperature.	**5**	**CO4**

<table>
<tr><td>Q 8b</td><td>Give 5-typical instruments that has to be deployed and its purpose for carrying out an energy audit of a DG set.</td><td>5</td><td>CO4</td></tr>
<tr><td>Q 9</td><td>Estimate tonne of refrigeration from the data given below for two AHUs.

<table><tr><th>Parameter</th><th>AHU - A</th><th>AHU-B</th></tr><tr><td>Evaporator area (m^2)</td><td>8.75</td><td>0.39</td></tr><tr><td>Inlet Velocity (m/s)</td><td>1.81</td><td>11.50</td></tr><tr><td>Inlet air DBT (℃)</td><td>21.5</td><td>24.5</td></tr><tr><td>RH (%)</td><td>75.0</td><td>73.5</td></tr><tr><td>Enthalpy (kJ/kg)</td><td>53.0</td><td>59.3</td></tr><tr><td>Outlet air DBT (℃)</td><td>17.4</td><td>19.5</td></tr><tr><td>RH (%)</td><td>90.0</td><td>83.0</td></tr><tr><td>Enthalpy (kJ/kg)</td><td>46.4</td><td>53.0</td></tr><tr><td>Density of air (kg/m^3)</td><td>1.14</td><td>1.05</td></tr></table></td><td>10</td><td>CO4</td></tr>
<tr><td colspan="4">SECTION-C</td></tr>
<tr><td>Q 10</td><td>Calculate the following from the data given below:
a) kVAr required to improve PF to 0.95 lag
b) reduction in kVA demand
c) techno-economics of PF improvement option
Data
Rating of transformer = 1600 kVA, Average loading on the transformer = 1020 kVA
Present power factor (old pf) = 0.64 (lag), Demand charges/kVA = Rs 150/kVA
Unit cost of Capacitor/kVAR = Rs. 300, Transformer no-load loss/hour = 2.4 kW
Transformer Full -load loss/Hour = 18.57 kW
Required rating of the capacitor banks to improve the pf from the present PF of 0.64 (lag) to 0.95 (lag).
Take the unit price of capacitor as Rs.300 per kVAr.</td><td>20</td><td>CO2</td></tr>
<tr><td>Q 11</td><td>A layout dimension of an office building was 9 m length by 6 m width. The height of the lamp fixed above the desk plan area is 3 m. The total circuit watt for the entire lighting is 1200 W. The measured lux level at the existing condition was 600 lux using lux meter. The lux level was improved to 800 lux by modification of layout fittings. The target lux of this office is 40 lux/watt/m^2.
Find out energy saving potential if office is working 10 hours a day for 300 working days using ILER method.</td><td>20</td><td>CO5</td></tr>
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