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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, July 2020

Course: Performance Assessment of Electrical equipment **Semester: II.**
Program: M.Tech. – Energy System **Time 03 hrs.**
Course Code: EPEC8001 **Max. Marks: 100**
Instructions:

1. **Attempt all the questions (Theory, Numerical, Case study etc.) on A4 size blank sheets.**
2. **Attempt all questions serially as per question paper.**
3. **Answer should be neat and clean. Draw a free hand sketch for circuits/tables/schematics wherever required.**
4. **Scan the whole answer script and check the resolution carefully before upload on the blackboard. Note that answer scripts will be considered for evaluation only through Blackboard. No other mode of submission is acceptable.**
5. **You are expected to be honest about each attempt which you make to progress in life**

SECTION A 40 Marks

		Marks	CO
Q 1	One Plant has one compressor of capacity 1680 m^3/h. Free air delivery of the compressor is carried out by filling the receiver. The test data is as follows: Receiver capacity : 10 m^3, Interconnecting pipe : 1 m^3 Initial pressure in receiver : 1.0 kg/cm^2a , Inlet air pressure to compressor 1.0 kg/cm^2a Final pressure : 8.25 kg/cm^2a , Time taken to fill the receiver : 3 minutes (180 sec) Inlet air temperature : 30 ^oC , Air temperature in the receiver : 40 ^oC Motor rpm (D1) : 1400 , Motor pulley diameter (N1) : 300mm Compressor rpm (D2) : 700 rpm , Compressor Pulley diameter (N2) : 600 mm Average duration of loading : 40 minutes in an hour , Average duration of unloading : 20 minutes in an hour Power consumption during loading : 150 kW , Power consumption during unloading : 25 kW Cost of energy : Rs. 5.00 per kWh A). Find the Free air delivery of the compressor and % output when compared to rated capacity. B). Evaluate hourly consumption of air. C). How much energy (kWh) that the compressor will consume in an hour and in a day. D). Evaluate the specific power (cfm/kW) during loading period and overall specific power after considering the loading & unloading of compressor.	**20**	CO1

NOTE: The submission time of the Question Paper Answer Sheet is 24 Hrs From the scheduled time (*Exceptional provision due to extraordinary circumstance due to COVID-19 and due to internet connectivity issues in the far-flung areas*).
No Submission will be entertained after 24 Hrs

<table>
<tr><td>Q 2</td><td>Develop the check sheets for auditing of ECBC (2017) Compliances in a commercial building.</td><td>20</td><td>CO4</td></tr>
<tr><td>Q 3</td><td>In one of the chlor Alkali plant, analysis of one of the operating parameter of a titanus impeller pump for flow of brine were as follows:
<table><tr><td></td><td>m³/hr</td><td>Head</td><td>kW</td></tr><tr><td>Rated</td><td>310</td><td>45</td><td>90</td></tr><tr><td>Actual</td><td>210</td><td>40</td><td>67</td></tr></table>On detailed examination of the flow/head requirement (maximum) was assessed to be 260 m³/h and 30 m. Though change of pump was one of the option, considering cost of special pumps impeller 'impeller cutting' was one of the options suggested which involves Rs 3.0 lakh as cost. Calculate likely annual saving after impeller cutting with pump efficiency at 65% and mptor efficiency at 85%, fluid density 1160 kg/m³ operating hours: 8000, unit rate: Rs 5/-</td><td>20</td><td>CO2</td></tr>
<tr><td colspan="4">SECTION - B (40 Marks)</td></tr>
<tr><td>Q 4</td><td>In a large paper plant, the following are the designed and measured parameters for a clear water pump.
<table><tr><th>Particulars</th><th>Design</th><th>Operating</th></tr><tr><td>Flow, m³/h</td><td>800</td><td>576</td></tr><tr><td>Head, m of WC</td><td>55</td><td>24
(after control valve)</td></tr><tr><td>Power, kW</td><td>160</td><td>124</td></tr><tr><td>Speed, rpm</td><td>1485</td><td>1485</td></tr></table>The pump delivery has been throttled to about 30% (closed) manually to get the required flow rate. Normal required water flow rate is 500 m³/h to 700 m³/h.

Calculate the present operating efficiency.

In your opinion, what should be optimum solution to get the required flow rate variation?</td><td>10</td><td>CO2</td></tr>
<tr><td>Q5</td><td>Draw a schematic diagram of VFD and explain how it saves energy at lower speed.</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 6</td><td>Illustrate three different methods for flow control of Fans.</td><td>5</td><td>CO1</td></tr>
<tr><td>Q 7</td><td>Describe the various water losses in Cooling Tower</td><td>5</td><td>CO2</td></tr>
<tr><td>Q 8</td><td>Write some strategies for correcting poor power factor in motors</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 9</td><td>Compare the various dryers for compressed air</td><td>5</td><td>CO1</td></tr>
<tr><td>Q 10</td><td>Describe the ASHRAE Level-2 energy audit of a commercial building</td><td>5</td><td>CO4</td></tr>
</table>

NOTE: The submission time of the Question Paper Answer Sheet is 24 Hrs From the scheduled time (*Exceptional provision due to extraordinary circumstance due to COVID-19 and due to internet connectivity issues in the far-flung areas*).
No Submission will be entertained after 24 Hrs