Name: **Enrolment No:**	UPES

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

Course: Electrical Machines II (EPEG 2011) **Semester: IV**
Programme: B.Tech Electrical Engineering **Max Marks:100**
Instructions: **Duration: 3 Hrs**

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. **If graph sheet is not available students can make their own using scale and pen.**
6. **You are expected to be honest about each attempt which you make to progress in life**

S. No.		Marks	
	Section A		
Q 1	Plot the Circle Diagram of Induction motor with following data and calculate the Max. Torque, Max. Power Factor, Max. Power Rating: 3-Phace, Star, 4 pole, 440 V, 50 Hz, 6 HP, Full load PF = 0.83 (lag), 1440 RPM Free Running Test: 440 V, 2.5 A, 400 W Blocked Rotor Test: 65 V, 7.5 A , 750 W For the purpose of calculating stator losses, assume losses during blocked rotor test are purely copper losses and stator resistance as 1.2 Ohm/phase.	**20**	**CO3**
Q.2	A 1000 kVA, 11000 V, 3-Phase, Star connected, Turbo Alternator has an effective stator resistance of 2 Ohm/ph. The OCC and Full load ZPF data are as following: OCC (V): 5805, 7000, 12550, 13755, 15000 Filed Current (A): 40, 50, 110, 140, 180 Terminal (V) at ZPF (FL): 0, 1500, 8500, 10500, 12400 Estimate % Regulation at Full Load & 0.8 pf lagging	**20 M**	**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></td><td>Section B</td><td></td><td></td></tr>
<tr><td>Q.3</td><td>Construct curves showing the relation between armature current v/s field current & power factor v/s field current for a star connected synchronous motor with a synchronous reactance of 8.25 Ω/ph and negligible resistance. The machine takes a constant power input of 800 kW at 6.6 kV. The OC characteristic is as follows:
<table>
<tr><td>V (kV)</td><td>3</td><td>4</td><td>5</td><td>6</td><td>6.6</td><td>7</td><td>7.5</td><td>8</td></tr>
<tr><td>I_f Amp</td><td>16</td><td>23</td><td>31</td><td>41</td><td>50</td><td>56</td><td>69</td><td>85</td></tr>
</table>
</td><td>10 (Calculation) 10 (Graph)</td><td>CO2</td></tr>
<tr><td>Q.4</td><td>With neat phasor diagram, explain how synchronous motors can be used as synchronous condensers. How synchronous condensers are superior over Capacitor in PF improvement.</td><td>10</td><td>CO2</td></tr>
<tr><td>Q.5</td><td>Explain the T-S Characteristics of IM. Also explain the condition for Maximum Torque. Explain what you understand about the maximum torque and how can you increase the maximum torque of an squirrel cage IM.</td><td>10</td><td>CO3</td></tr>
<tr><td>Q.6</td><td>Explain the Cross magnetizing and Demagnetizing armature reactions. Explain the effect of Magnetizing reaction on the terminal voltage. With neat phasor diagram explain which type of load will cause Magnetizing armature reaction.</td><td>10</td><td>CO1</td></tr>
<tr><td>Q,7</td><td>Explain why Single Phase IM are not self starting? Explain the role of capacitors, shaded rings in single phase IMs</td><td>10</td><td>CO4</td></tr>
</table>

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