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

Course: Electrical Actuators and Drives   **Semester: II**
Program: M.Tech- Automation and Robotics Engineering   **Time 03 hrs.**
Course Code: ECEG-7009   **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

S. No.		Marks	CO
Q 1	A 400 V, star connected, 3 phase, 4 pole, 50 Hz induction motor has following parameters referred to the stator: Stator and rotor resistance=1 ohm, Stator and rotor reactance= 2 ohm. For regenerative braking operation of this motor determine: (i) Maximum overhauling torque it can hold and range of speed for safe operation. (ii) Speed at which it will hold an overhauling load with a torque of 100 N-m. Maximum overhauling torque the motor can hold as a ratio of maximum overhauling torque without capacitor if a capacitive reactance of 1.5 ohm is inserted in each phase of stator.	**20**	**CO 2**
Q 2	a. Now a days, in almost every application, hydraulic motors are used, and to control them hydraulic pumps and valves are employed. Depending on their application to the robotics actuation, explain with the help of neat diagram. b. Describe the operation of stator voltage control and rotor voltage control in induction motor drives.	**10+10**	**CO 1,3**

NOTE : The submission time of the Question Paper Answer Sheet is 24 Hhrs 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

	SECTION B - 60 Marks		
Q 3	A 220 V, dc series motor runs at 1000 rpm (clock wise) and takes an armature current of 100 A when driving a load with a constant torque. Resistances of the armature and field windings are 0.05 ohm each. Find the magnitude and direction of motor speed and armature current if the motor terminal voltage is reversed and the number of turns in field winding is reduced to 80%. Assume linear magnetic circuit.	10	CO3
Q4	A 200V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06 ohm. It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V, 50 Hz. Assuming continuous conduction, Calculate a) Firing angle for rated motor torque and 750 rpm. b) Firing angle for rated motor torque and (-500) rpm.	10	CO 3
Q 5	Define the term solid-state relay and Reed-Relay-Coupled SSR with neat diagram.	10	CO 4
Q 6	Draw the torque-speed and slip characteristics of induction motor and briefly describe the various mode comes under the characteristics.	10	CO 1
Q 7	Describe the operation of closed loop torque and closed loop speed control scheme with inner current control loop.	10	CO 2
Q 8	List down the various control strategies for speed control of Induction Motor and explain any two speed control method for slip ring induction motor.	10	CO 2

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