This exam measure the following ILOS (a.19, b.15, c.15, and c.17)
Please, answer all of them; assume any missing data; manage your time.

Q1:   (15 Marks)

a) What is meant by Electrical Drives? And what are the different factors for the selection of electrical drives?   [5 Marks]

b) A drive used in a hoist to raise and lower weights up to 400 kg at velocities up to ± 2 m/s. The weight hangs from a cable that is wound on a drum of radius of 0.4 m . The drum is driven by the drive motor through a gearbox that has an efficiency of 85% . The maximum speed of the motor is ± 1300 rpm. It is required to: (*i*) Sketch the system and find the nearest integer gearbox ratio that will match the maximum speed of the motor to the maximum velocity of the hoist. (*ii*) Determine the torque and power provided by the motor when lifting the maximum weight at the maximum velocity. (*iii*) Calculate the torque and power provided by the motor when lowering the maximum weight at the maximum velocity.   [10 Marks]

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Q2:   (15 Marks)

(a) Draw the typical temperature rise-time curve and derive the equation for temperature rise in an electric drive.   [5 Marks]

(b) Explain with needed sketch the different type of mechanical friction [10 Marks]

(c) A motor has a thermal heating time constant of 45 min. When the motor runs continuously on full rating; its final temperature rise is 75 C°. (*i*) What is the temperature rise after two hour if the motor runs continuously on full load? (*ii*) If the temperature on one hour rating is 70 C°, find the maximum steady temperature at this rating.   [10 Marks]

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Q3:   (20Mark)

(a) Draw a neat schematic diagram of a four point starter and explain its working?
                                                                           [5 Marks]

(b) Find the value of the step resistance in a 6-stud starter for a 5 h.p. (3.73 kW), 200-V shunt motor. The maximum current in the line is limited to twice the full-load value. The total Cu loss is 50% of the total loss. The normal field current is 0.6 A and the full-load efficiency is found to be 88%.   [15 Marks]

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Q4:   (20 Marks)

(a). Draw and explain the Forward regeneration circuit of Four-Quadrant Chopper

Drives and its wave forms   [10 Marks]

Kafrelsheikh University
Faculty of Engineering
Subject: **Elective Course 2 (Electrical Drives)**
Year: Fourth Electrical Power (R.2007)
Exam Date: 1 /3/2021

Final Exam of september-2020-2021
Department of Electrical Engineering
course code: EPM4120   Full Mark: 90 Marks
Number of pages: 2   Time allowed: 3 hours

(b) A dc series motor is powered by a dc chopper as shown in Fig.1. The armature current is continuous and has negligible ripple. If the duty cycle of the chopper is 0.75, determine the (*i*) input power from the source, (*ii*) equivalent input resistance of the chopper drive, (*iii*) motor speed and (*iv*) developed torque. The back emf constant of the motor kv = 15.27 mV/A-rad/s.   [10 Marks]

Fig.1
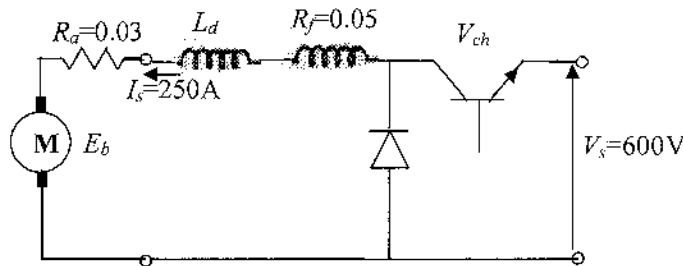
Q5:   (20 Marks)

(a) Compare between both the rotor voltage injection and voltage / frequency methods for controlling the induction motor speed, support your answer with the characteristics curves for both methods.   [5 Marks]

(b) A 400 V, four-poles, 50 Hz, Y-Connected induction motor has an inductive reactance of 4Ω and a stator resistance of 0.2Ω. The rotor resistance referred to the stator is 0.3Ω. The motor is driving a constant-torque load of 60 Nm at a speed of 3000 rpm. Assume that this torque includes the rotational components, calculate the maximum frequency of the supply voltage that will not stop the motor? [15 Marks]

With our best wishes

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