Kafrelsheikh University — Final Exam of september-2015-2016
Faculty of Engineering — Department of Electrical Engineering
Subject: **Electrical Drives** — course code: EPM — Full Mark: 90 Marks
Year: Fourth Electrical Power (R.2007) — Number of pages: 2 — Time allowed: 3 hours
Exam Date: 9 /1/2016

Attempt all question

Q1: (20 Mark)

a) Explain the factors affecting the selection of electric drive?

b) Determine the horse power rating of the motor driving a system via two reduction gear boxes as shown in Fig.1 where, ($\eta_1 = \eta_2 = 95\%$), ($u_1 = 1/5$, $u_2 = 1/10$), ($m_1 = 1000$ kg, $m_2 = 600$ kg, $M_3 = 500$ kg), ($D_1 = 40$ cm, $D_2 = 20$ cm) and the torque of load 1 is 3 N.m and motors runs at a speed of 1500 rpm. Also find the system moment of inertia if motor inertia is 2 kg.m^2 and for drum D_1 is 0.02 kg.m^2 and for drum D_2 is 0.01 kg.m^2 and of load 1 is 10 kg.m^2. The motor torque when rising rated load at an acceleration of 1.5 m/s^2 and when lowering it to a deceleration of 1.5 m/s^2.

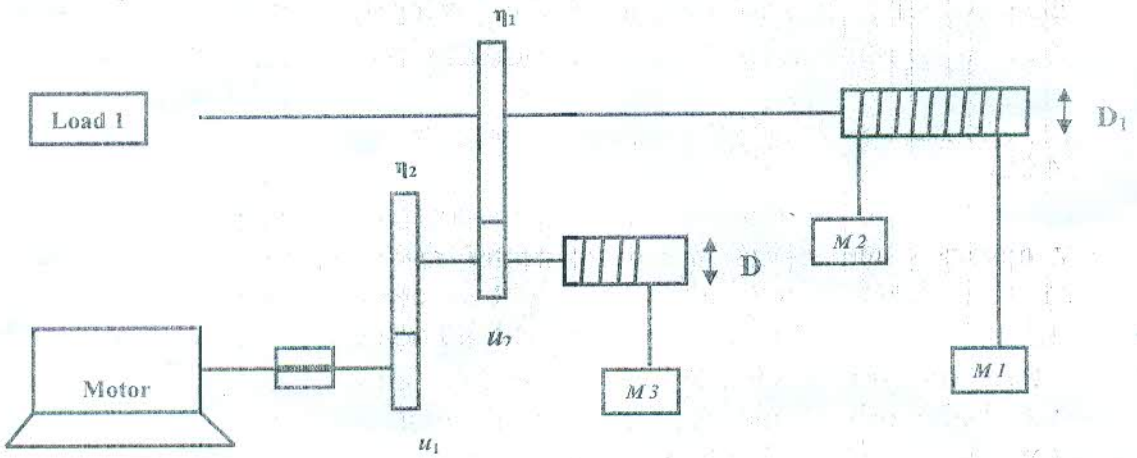

Fig.1 For Problem 1.b

Q2: (25 Mark)

(a) An electric motor is subjected to a load-torque variation as given in table below:

T N.m	40	0	20	0
t min	10	5	10	5

If the speed of the motor is 720 rpm, find the power rating of the motor.

(b) A 250 V, DC shunt motor has an armature resistance of 0.15 Ω. It is permanently coupled to a constant torque load of such magnitude that the motor takes an armature current of 120 A when running at speed of 600 r.p.m. for emergency, provision must be made to stop the motor from this speed in a time not greater than 0.5 sec. the peak braking current must be limited to twice the rated value and dynamic braking is to be employed with the field excited to give rated flux corresponding to rated speed running. Determine the value of the external armature circuit resistance required and the maximum permissible inertia of the motor and its coupled load, which will allow braking to stand still in specified time.

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Q3: (25 Mark)

(a) Explain the four quadrant operation of dc chopper drive; support your answer with needed wave forms?

(b) A dc chopper controls the speed of a dc series motor. The armature resistance. Ra = 0.04 Ω, field circuit resistance, Rf = 0.06 Ω, and back emf constant, kv = 35 mV/rad/s. The dc input voltage of the chopper, Vs = 600 V. If it is required to maintain a constant developed torque of Td = 547 N.m, plot the duty cycle, k, of the chopper against the motor speed.

Q4: (20 Mark)

(a) Explain the voltage, current and frequency control method of induction motor.

(b) A three phase 35 hp, 4-pole, 50 Hz, 1450 rpm, Y-connected induction motor has the following parameters: $R_s = 0.2\ \Omega$, $R_r = 0.22\ \Omega$, $X_s = 1.2\ \Omega$, $X_r = 1.8\ \Omega$, and $X_m = 13\ \Omega$. The motor is controlled by current source inverter and $I_i = 47$ A. if the frequency is 38 Hz and $T_d = 140$ N.m. determine: (*i*) s_{mT}, (*ii*) T_m. (*iii*) ω, (*iv*) V_a, (*v*) *s*, (*vi*) *pf*.

With my best wishes

Dr. Eng./ Mohamed I. Abd EL_Wanis