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| (Following paper code and roll No. to be filled in your answer book). | |
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**M.Tech.**
**FIRST SEM. EXAMINATION, 2010-11**

***Time: 3hrs.*** ***Max. Marks: 100***

***Subject:*** *FUNDAMENTALS OF ELECTRIC DRIVE*

***Note:*** *(1) Attempt all questions.*
*(2) All questions are equal marks.*
*(3) Notations used have usual meaning.*
*(4) Assume any relevant data, if missing.*

Q1. Attempt any **Two** of the following

(a) State essential parts of electrical drives. What are the functions of the power modulators?

(b) What are the main factors which decide the choice of electric drive for a given application also discuss the current status of ac and dc drives.

(c) A motor drives two loads. One has rotational motion. It is coupled to the motor through a reduction gear with a= 0.1 and efficiency 95%.The load has a moment of inertia of 10kg-$m^2$ and a torque of 10 N-m. Other load has translational motion and consists of 100kg weight to be lifted up at an uniform speed of 1.5m/s. Coupling between this load and the motor has an efficiency of 83%. Motor has an inertia of 0.2kg-$m^2$ and runs at a constant speed of 1450 rpm. Determine equivalent inertia referred to the motor shaft and power developed by the motor.

Q2. Attempt any **Two** of the following

(a) Derive an expression for frequency of operation of motors subjected to Intermittent Loads.
The temperature rise of a motor when operating for 25 minutes on full load is 25°C and becomes 40°C when the motor operates for another 25 minutes on the same load.

Determine the heating time constant and the steady state temperature rise.

(b) Explain load equalization and derive an expression for moment of inertia of a flywheel mounted on the shaft of a motor used to overcome the effect of load fluctuations.

(c) Discuss the "Retardation test" used to measure the moment of inertia of the motor experimentally, also explain the precautions to be taken during the measurement of the moment of inertia by this method.

Q3. Attempt any **Two** of the following

(a) i. when plugging is employed for stopping an induction motor, why is it necessary to disconnect it from supply when speed reaches close to zero.

ii. During plugging operation of an induction motor, usually a external resistance is inserted into the rotor circuit, why?

(b) Why 1-phase ac dynamic braking of a star connected induction motor with 2 lead connection is able to produce only a small braking torque? also explain 3 lead connection of ac dynamic braking.

(c) A 400 Volt, 750 rpm, 60 Amp dc shunt motor has an armature resistance of 0.3 ohm. When running under rated condition, the motor is to be braked by plugging with armature current limited to 90 Amp. What external resistance should be connected in series with the armature? Calculate the initial braking torque and its value when the speed has fallen to 300rpm. Neglect saturation.

Q4. Attempt any **One** of the following

(a) Derive the expression for "Specific energy consumption" when a train is moving on a leveled track (treat track as a trapezoidal track). The average speed between stops on a level section of railway is 1.25km.Motor-coach train weighing 250 tonne has a scheduled speed of 30km/h, the duration of stops being 30 seconds. The acceleration is 1.9km/h/s and the braking retardation is 3.2 km/h/s. Train resistance to traction is 45N/t. Allowance for rotational inertia is 10%.Calculate the specific energy output in Wh/t-km. Assume a trapezoidal speed-time curve.

(b) Derive the expression for " Linear Force" in case of linear induction motor, also discuss the constructional features ,working and applications of linear induction motor.

Q5. Attempt any **One** of the following

(a) i. Discuss the important features of "Stepper Motors" also explain the Stepping Rate characteristics of the stepper motor.
ii. Discuss the suitability of drive for the following purposes.
(a) Textile mills (b) paper mills (c) cement industry

(b) A 440 Volt,50 Hz, 6 - pole, Y- connected wound rotor induction motor has the following parameters referred to the stator : $R_s = .08\ \Omega$, $R_r' = 0.12\ \Omega$, $X_s = 0.25\ \Omega$, $X_r' = 0.35\ \Omega$ and $X_m = 10\ \Omega$. An external resistance is inserted into the rotor circuit so that the maximum torque is produced at $s_m = 2.0$. The motor connections are now changed from motoring to 1-phase ac dynamic braking with three lead connections. Calculate the braking torque for a speed of 900 rpm.