Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
PROCTORED ONLINE MAKEUP EXAMINATIONS, FEBRAUARY 2022

SOLID STATE DRIVES [ELE 4088]

REVISED CREDIT SYSTEM

Time:75 Minutes **Date: 17 February 2022** **Max. Marks: 20**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Consider a hoist drive shown in the Fig.1A. The motor is coupled to the rope drum through a gear mechanism, whose gear ratio is g_1= 0.1. The load mass is M = 500kg, the motor inertia is Jm = 0.5 kgm^2, and the rope drum inertia is J_L = 48.5 kgm^2. The radius of the rope drum is r = 0.25 m. The rope mass, gear inertias, and the mechanical losses are omitted. Calculate the equivalent total inertia at the motor side and the equivalent load torque at the motor side.

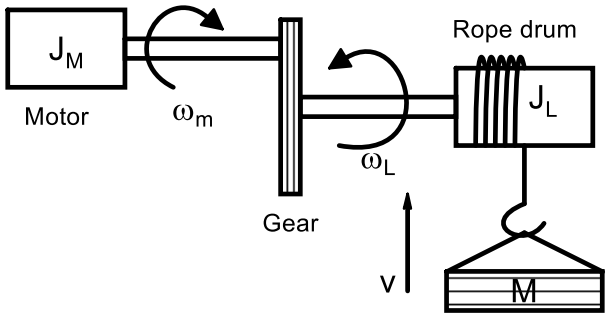

Fig. 1A ***(05)***

1B. Speed torque curves of the motors under different operations are shown in Figure 1B. Draw load curves which will give stable operation with the portion of characteristics marked as, **DE** and **FE**. Justify your answer.

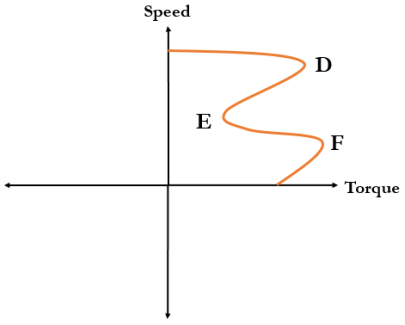

Figure 1B. ***(03)***

1C. Differentiate between true synchronous mode and self-control mode for variable frequency control of Synchronous motor. Suggest which method is suitable for pump drive. ***(02)***

2A. A 220 volts, 1500 rpm, 10 Amps separately excited dc motor has an armature resistance and inductance of 1 Ω and 28mH. It is fed from a single phase fully controlled bridge rectifier with an ac source voltage of 230 volts, at 50 Hz. Identify the mode of operation and compute developed torque at the firing angle of 45º and speed of 1000 rpm. ***(04)***

2B. A 250V separately excited DC motor has an armature resistance of 2.5Ω. When driving a load at 600 rpm with constant torque, the armature takes 20A. This motor is controlled by a class A chopper with a frequency of 100Hz and an input voltage of 250V. Determine the duty ratio if the speed is reduced to 400 rpm with the load torque maintained constant. ***(03)***

2C. A 3-phase delta connected 6 pole, 50Hz, 400V, 925rpm, squirrel cage induction motor has the following parameters

$Rs = 0.2\ \Omega$, $Rr^1 = 0.3\ \Omega$, $Xs = 0.5\ \Omega$, $Xr^1 = 1\ \Omega$.

The motor is fed from a voltage source inverter at constant V/f ratio. Calculate

(i) speed for the frequency of 35Hz at full load torque.
(ii) Frequency for a speed of 600rpm at full load torque

(03)