PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - APR 2023

Semester : Semester VI - 2020

Course Code : EEE3001

Course Name : Sem VI - EEE3001 - Electrical Drives

Program : B.Tech. Electrical and Electronics Engineering

Date : 12-APR-2023

Time : 9.30AM - 11.00AM

Max Marks : 60

Weightage : 30%

Instructions:

(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS   (5 X 2 = 10M)

1. The traction motor used in WAP5 engine employs regenerative braking to bring the locomotive to stand still position. The power developed during the process is _____

   a) Zero   (CO1) [Knowledge]

   b) Negative

   c) Positive

   d) Infinity

2. A hoist is installed in an apartment is an example of electrical drive. In order to understand the conventions of motor torque, load torque and speed to design the traction motor _____ condition is considered

   a) Weight of empty cage>Counter weight>loaded cage   (CO1) [Knowledge]

   b) Weight of empty cage< Counter weight> loaded cage

   c) All weights are equal

   d) Weight of empty cage< Counter weight< loaded cage

3. In a textile mill, it is required to maintain certain tension to roll the cloth in a spindle. Mention the conventions of speed and torque of the motor which is connected to the spindle.

   a) both Positive   (CO1) [Knowledge]

   b) Speed Negative and Torque positive

   c) both negative

   d) Torque Negative and Speed positive

4. In the block diagram of an electric drive_____block plays a major role in selection of quadrant of operation.

  a) Source   (CO1) [Knowledge]

  b) Power Modulator

  c) Control Unit

  d) Sensor

5. A 220V, 10.5A, 1300rpm separately excited DC motor is used to roll the paper sheet in paper industry. A DC shunt motor is controlled by a single phase controlled rectifier. It is decided to run the motor at the maximum speed and firing angle of the rectifier is_____degrees

  a) Zero   (CO2) [Knowledge]

  b) 90

  c) 17.92

  d) 13.23

<div align="center">

PART B

ANSWER ALL THE QUESTIONS   **(2 X 15 = 30M)**

</div>

6. In a thermal power plant, the exhaust fan is controlled by an electric drive. The motor and load torque characteristics are $T = (1 + 2\omega_m)$ and $T_l = 3\sqrt{\omega_m}$. During the operation, the new equilibrium point has been observed and motor speed is 1 rad/sec and motor torque at that condition is 3N-m. Comment on the reason for un-stability of the drive system and also compute the steady state points.

<div align="right">

(CO1) [Comprehension]

</div>

7. A 220V, 10 A, 1000rpm DC shunt motor is used in conveyor belt applications and shown in Fig. To shift the materials from one place to another, It is required to rotate at a speed of 500 rpm in both directions at half rated torque. The available power converters in the workshop are single phase semi converter and single phase fully controlled rectifier, both are fed with 1-phase 230V, 50Hz supply.(Assume armature resistance as 0.05ohms) . While operating it is observed that the thyristors could not be fired at the firing angle of 5 degrees.(there is no problem in firing circuits)

<div align="center">

Fig. DC shunt motor in conveyor belt drive

</div>

i. Identify problem in firing the thyristors (10M)
ii. Comment on the variation of firing angle, if the speed requirement increases.(5M)

<div align="right">

(CO2) [Comprehension]

</div>

<div align="center">

PART C

ANSWER THE FOLLOWING QUESTION   **(1 X 20 = 20M)**

</div>

8. Compute the equilibrium points and comment on their steady state stability when motor and load torques are $T = (1 + 2\omega_m)$ and $T_l = 3\sqrt{\omega_m}$. Mention the reason for unstability

<div align="right">

(CO1) [Application]

</div>