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SUBJECT CODE NO:- H-307
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (EEP/EE/EEE)
Electrical Drives
(REVISED)

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
- 1) Q.1 and Q.6 are compulsory.
 - 2) Solve any two questions from Q.2 to Q.5 and any two questions from Q.7 to Q.10.
 - 3) Assume suitable data if required.

Section A

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|-----|--|---------------------|
| Q.1 | Attempt any Five. | 10 |
| | <ol style="list-style-type: none"> a) What are drives and electrical drives. b) Mention the motors commonly used in electrical drives. c) What are the disadvantages of electric drives? d) What are the three components of Load torque? e) What is braking in DC motor drive? Mention its types. f) What are the drawbacks of rectifier fed dc drives. | |
| Q.2 | <ol style="list-style-type: none"> a) Explain the multiquadrant operation of an electric motor driving a hoist load. b) What are the advantages of closed loop control of drives and explain current limit control with block diagram. | <p>08</p> <p>07</p> |
| Q.3 | <ol style="list-style-type: none"> a) Derive the expression to find the equivalent load torque and equivalent inertia of loads in translational and rotational motion. b) The drive has the following parameters $T=150-0.1N$, N-m, where N is the speed in rpm. Load Torque $T_1=100$, N-m. Initially the drive is operating in steady state. The characteristics of the load torque are changed to $T_1=-100$, N-m. Calculate initial and final equilibrium speeds. | <p>08</p> <p>07</p> |
| Q.4 | <ol style="list-style-type: none"> a) Explain the operation of single phase fully controlled rectifier fed separately excited DC motor for continuous conduction. b) A 220v, 1500rpm, 10A separately excited d.c. motor is fed from a single phase fully controlled rectifier with an a.c source voltage of 230V, 50Hz, $R_a=2\Omega$. Conduction can be assumed to be continuous. Calculate firing angles for <ol style="list-style-type: none"> i. Half the rated Motor torque and 500rpm. ii. Rated Motor torque and (-1000) rpm. | <p>07</p> <p>08</p> |

- Q.5 Write short notes.
- a) Chopper Fed dc drives. 05
 - b) Recent trends in D.C. drive control. 05
 - c) Industrial application of D.C. Motor drive. 05

Section B

- Q.6 Attempt any Five. 10
- a) Why the control of a three-phase induction motor is more difficult than D.C. motor.
 - b) What is meant by V/F control?
 - c) For which applications the stator voltage control method is suitable.
 - d) What is Slip power recovery scheme?
 - e) What are the advantages of brushless D.C. motor?
 - f) Give some applications of load-commutated inverter fed synchronous motor drive.

- Q.7
- a) Explain using a power circuit how the speed of Induction motor drive can be controlled by using voltage source Inverter. 07
 - b) Explain using power circuit the working of a static Kramer drive system. 08

- Q.8
- a) Explain in detail true synchronous mode and self-control mode for variable frequency control of synchronous motor. 07
 - b) A 2.8kw, 400v, 50Hz, 4pole, 1370rpm, delta connected squirrel Cage Induction motor has the following parameters referred to the stator. 08

$$R_s = 2\Omega, R_r' = 5\Omega, X_s = X_r' = 5\Omega, X_m = 80\Omega.$$

Motor speed is controlled by stator voltage control. When driving a fan load it runs at rated speed at rated voltage. Calculate

- i. Motor terminal voltage.
 - ii. Motor current.
 - iii. Motor Torque.
- For motor speed of 1200rpm.

- Q.9
- a) Explain in detail, why the load commutated inverter fed synchronous motor drive is found suitable for high power applications. 07
 - b) A 20kw, 3phase, 440v, 4pole, delta connected permanent magnet synchronous motor has following parameters. 08
- $X_s = 5\Omega, R_s = 0\Omega$, Rated p.f.=1.0 machine is controlled by variable frequency control at a constant (V/F) ratio. Calculate
- i. Armature current.
 - ii. Torque angle.
 - iii. Power factor.
- For half full load torque and 750rpm.

Q.10

Write short notes.

- a) V/F control of Induction Motor Drive.
- b) Industrial Applications of A.C.drives.
- c) Brushless d.c.motor drives.

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05
05