

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)



B. Tech (Sixth Semester - Regular) Examinations, April 2026

23BELPC36003 – Electrical Drives

(EE)

Time: 3 hrs

Maximum: 60 Marks

Answer ALL questions
(The figures in the right hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

	CO #	Blooms Level
a. Mention the different types of classes of duty.	CO1	K1
b. Identify major industrial applications of DC drives.	CO2	K2
c. Interpret the basic concept of vector control used in AC drives.	CO4	K3
d. Analyse the impact of harmonics on motor performance.	CO5	K4
e. Outline the concept of digital control used in electric drive systems.	CO6	K2

PART – B

(10 x 5 = 50 Marks)

Answer **ALL** the questions

	Marks	CO #	Blooms Level
2. a. Write fundamental components of an electric drive system with a suitable block diagram and explain the role of each component in the overall operation of the drive.	5	CO1	K2
b. The temperature rises of a motor when operating for 25 min on full load is 25°C and becomes 40°C when the motor operates for another 25 min on the same load. Determine the heating time constant and steady state temperature rise	5	CO1	K3
(OR)			
c. Derive the Fundamental Torque Equation and Explain the four quadrants operation of Electric Drive.	5	CO1	K3
d. Explain active and passive load torque, and illustrate the components of load torque with suitable examples.	5	CO1	K2
3.a. Explain how electric braking is employed in a DC shunt motor.	5	CO2	K2
b. A constant speed drive has the following duty cycle.	5	CO2	K3
a) Load rising from 0 to 400KW; in 5 minutes.			
b) Uniform load of 500KW; 5 minutes.			
c) Regenerative power of 400KW returned to supply; 4 minutes.			
d) Remains Idle for; 2 minutes.			
Estimate power rating of the motor. Assume losses to be proportional to power.			
(OR)			
c. Illustrate the principle of speed control of a DC drive using a fully controlled rectifier with a suitable circuit diagram.	5	CO3	K2
d. The speed of a 15hp, 220V, 1000rpm dc series motor is controlled using a 1Φ half controlled bridge converter. The combined armature and field resistance is 0.2Ω. Assuming continuous and ripple free motor current and speed of 1000	5	CO3	K3

rpm and $K=0.03\text{Nm/A}^2$, determine

- a) motor current
- b) motor torque for a firing angle $\alpha=30^\circ$.

Supply AC voltage is 250V.

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|------|--|---|-----|----|
| 4.a. | With diagram explain auto transformer starter control for three phase induction motor | 5 | CO4 | K2 |
| b. | A 3-phase, 4 pole, 415V, 50Hz IM has a star connected stator. The rotor impedance at standstill is $(0.1+j0.9)\ \Omega$. The stator to rotor turns ratio is 1.75 Calculate external resistances per phase required in the rotor to limit starting rotor current to 60A. | 5 | CO4 | K3 |
| (OR) | | | | |
| c. | Analyze the speed control scheme of a three-phase induction motor using an AC voltage controller. | 5 | CO4 | K4 |
| d. | A 2.5 kW, 440V, 50HZ, 4 poles, 1370rpm delta connected squirrel cage induction motor has following parameters referred to the stator. Motor speed is controlled by stator voltage control. When driving a fan load it runs at rated speed at rated voltage. | 5 | CO4 | K3 |
| 5.a. | Explain the concept of open loop V\F control of synchronous motor. | 5 | CO5 | K2 |
| b. | A three-phase synchronous machine rated at 5 MW, 10 kV, 50 Hz operates at a power factor of 0.9 and an efficiency of 96%. Determine the rated current drawn by the machine. | 5 | CO5 | K3 |
| (OR) | | | | |
| c. | Examine the operation of voltage source inverter-fed synchronous motor drives with a suitable diagram. | 5 | CO5 | K3 |
| d. | Illustrate the working principle of cyclo-converter-fed synchronous motor drives. | 5 | CO5 | K2 |
| 6.a. | Evaluate the drive systems used in lifts and cranes based on their operational requirements. | 5 | CO6 | K4 |
| b. | Illustrate the advantages and limitations of digital control in electric drive systems. | 5 | CO6 | K2 |
| (OR) | | | | |
| c. | Write short notes on drives used in paper mills. | 5 | CO6 | K2 |
| d. | Explain the digital techniques used for speed control of electric drives with suitable examples. | 5 | CO6 | K3 |

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