





9. Identify the components of closed loop drive operation CO3 [K<sub>2</sub>]  
 A. Speed sensor    B. Error detector    C. Current controller  
 a) A and B b) B and C  
 c) A and C d) A, B and C
10. Identify the correct sequence of components in PLL drive CO3 [K<sub>2</sub>]  
 [A. Phase detector    B. Power converter    C. Low pass filter]  
 a) A-B-C b) B-A-C  
 c) B-C-A d) A-C-B

**PART B (10 x 2 = 20 Marks)**

11. Write the torque equation of DC motor CO1 [K<sub>1</sub>]
12. Draw the speed torque characteristics of fan type and hoist loads CO1 [K<sub>2</sub>]
13. Choose the AC-DC converters for i) Two quadrant DC Drive CO2 [K<sub>2</sub>]  
 ii) Four quadrant DC drive
14. What is the function of freewheeling diode in converter fed DC motor drive? CO2 [K<sub>2</sub>]
15. List the control strategies used in chopper fed DC motor CO2 [K<sub>2</sub>]
16. List the braking schemes for DC motor drives CO3 [K<sub>1</sub>]
17. Write the transfer of DC motor drive for armature voltage control CO3 [K<sub>2</sub>]
18. State the merits of PID controllers employed for DC drive system CO3 [K<sub>1</sub>]
19. What is the function of PLL in DC motor drive? CO3 [K<sub>1</sub>]
20. List the speed detection methods in DC drive CO2 [K<sub>1</sub>]

**PART C (6 x 5 = 30 Marks)**

21. Draw and explain Ward Leonard control method of DC motor CO1 [K<sub>2</sub>]
22. Describe multi quadrant operations of drives CO1 [K<sub>2</sub>]
23. A 200V, 1500 rpm, 20A separately excited DC motor has  $R_a=0.8\Omega$  and fed from fully controlled converter with 220V, 50 Hz, single phase AC input on continuous current mode. Calculate the value of firing angle for rated torque and 1200 rpm. CO2 [K<sub>3</sub>]

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|-----|---|-----|-------------------|
| 24. | Draw the circuit and explain the modes of operation of class A chopper fed DC motor drive | CO2 | [K <sub>2</sub> ] |
| 25. | Compare the performance of PI and PID controllers for DC motor drive                      | CO3 | [K <sub>2</sub> ] |
| 26. | With block diagram, explain the function of PLL in DC motor drive                         | CO3 | [K <sub>2</sub> ] |

**Answer any FOUR Questions**  
**PART D (4 x 10 = 40 Marks)**

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|-----|---|-----|-------------------|
| 27. | Explain the operation of three phase fully controlled converter fed DC motor with circuit and waveforms | CO2 | [K <sub>2</sub> ] |
| 28. | Draw and explain the modes of operation of four quadrant chopper fed DC motor drive                     | CO2 | [K <sub>2</sub> ] |
| 29. | Derive the transfer function of separately excited DC motor on armature control                         | CO1 | [K <sub>2</sub> ] |
| 30. | Explain the computer control of DC drive with block diagram and flowchart                               | CO3 | [K <sub>3</sub> ] |
| 31. | Draw and explain the gate firing scheme for converter fed DC drive with block diagram                   | CO3 | [K <sub>2</sub> ] |

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