ELECTRIC DRIVES (SEMESTER - 6)

CS/B.TECH (EEE)/SEM-6/EEE-604/09

1. ..... *Signature of Invigilator*

2. ..... *Signature of the Officer-in-Charge*

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH (EEE)/SEM-6/EEE-604/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ELECTRIC DRIVES (SEMESTER - 6)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B			Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

.....

Head-Examiner/Co-Ordinator/Scrutineer

6670 (05/06)

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ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ELECTRIC DRIVES

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) In a separately excited d.c. shunt motor, the energy loss during starting with no load is given by

a) $\frac{1}{2} W_0^2$ b) $\frac{1}{2} JW_0^2$

c) JW_0^2 d) $2 JW_0^2$.

ii) The example of active load is

a) friction b) hoist

c) fan load d) all of these.

iii) In a two quadrant chopper, the output voltage can be varied from

a) + *ve* maximum to – *ve* maximum

b) 0 to – *ve* maximum

c) 0 to + *ve* maximum

d) 0 to $\frac{1}{2}$ of + *ve* maximum.

iv) Dynamic braking is very effective if the D.C. motor is

a) series excited b) shunt excited

c) separately excited d) cumulative compound excited.

v) When a motor is supplied with half controlled converter, the operation of motor is in

a) 1st quadrant ($V - I$) b) 2nd quadrant

c) 1st & 2nd quadrants d) 1st & 4th quadrants. ☐

vi) The speed control of a slip-ring induction motor by a D.C. chopper in rotor circuit is suitable for

a) loads requiring high starting torque

b) wide range of speed control

c) control of speed below synchronous speed

d) control of speed above synchronous speed. ☐

vii) A phase controlled converter operates as naturally commutated inverter when the phase angle is

a) $< 90°$ b) $> 90°$

c) $0°$ d) $> 45°$. ☐

viii) Regenerative braking in a d.c. shunt motor can be achieved if

a) $E_b > V$ b) $V = E_b$

c) $V > E_b$ d) $E_b = 0$. ☐

ix) When operated by a forced commutated inverter, a synchronous motor operates at

a) lagging PF b) unity PF

c) leading PF d) any PF. ☐

x) A 3-phase induction motor with negligible stator resistance is operating with a current source inverter. Its stator voltage is

a) sinusoidal

b) sinusoidal, super imposed with peaks

c) distorted by harmonics

d) square wave. ☐

xi) Slip power recovery scheme can be applied to

a) wound rotor induction motor

b) squirel cage induction rotor

c) synchronous motor

d) any A.C. motors. ☐

xii) An induction motor can run as induction generator if slip is

a) > 1 b) 0

c) < 1 d) any value. ☐

xiii) A drive is the combination of

a) prime mover, control equipment, transmission system and load

b) prime mover, transmission system and load

c) prime mover

d) prime mover and load. ☐

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following questions. 3 × 5 = 15

2. Derive the torque-speed relationship of a D.C. series motor. Explain why a d.c. series motor can not be run under no load condition.

3. With the help of relevant circuit diagram, explain how the speed of a D.C. motor can be controlled by a D.C. chopper.

4. Explain constant torque and constant power operation of a drive.

5. Discuss APWM technique to control speed of induction motor.

6. Why are A.C. drives preferred over D.C. drives ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. 3 × 15 = 45

7. With the help of relevant torque-speed characteristics, explain different methods of braking of induction motor. 15

8. a) Explain how a phase controlled cycloconverter can be used to control frequency and applied voltage to a synchronous motor to control its speed. Draw necessary waveforms and circuit diagram.

   b) A 4-pole, 50 Hz, 3-phase induction motor has rotor resistance of 0·2 ohm per phase and rotor standstill reactance of 1 ohm per phase. The full load slip is 4%, calculate the extra resistance required in the rotor circuit per phase to reduce the speed to 1260 r.p.m. on the same load condition. 7 + 8

9. a) Discuss different methods of speed control of D.C. shunt motor.

   b) A 220 V D.C. series motor has an armature resistance of 0·3 Ω and a field resistance of 0·2 Ω. It runs at a speed of 700 r.p.m. taking a current of 20 A. Calculate the resistance to be inserted in series with the armature to reduce the speed to 600 r.p.m. The input current remains constant. Assume that the magnetisation characteristic is a straight line. 9 + 6

10. a) Explain the method of stator voltage control of 3-phase induction motor using A.C. voltage controller. Draw relevant circuit diagram and waveforms.

    b) Discuss a method to run an induction motor above synchronous speed. 10 + 5

11. Write short notes on any *three* of the following : 3 × 5

    a) DSP based drives

    b) Phase controlled converter

    c) Current source inverter

    d) Control techniques of power electronic/control drives.

END