CS/B.Tech (EE)(Supple)/SEM-7/EE-701/09
ELECTRIC DRIVES (SEMESTER - 7)

1. .....
Signature of Invigilator

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

Reg. No.

Roll No. of the Candidate

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CS/B.Tech (EE) (Supple)/SEM-7/EE-701/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JULY – 2009
ELECTRIC DRIVES (SEMESTER - 7)

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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Marks Obtained

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

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Head-Examiner/Co-Ordinator/Scrutineer

S–53035 (29/07)

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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 fan motor, the load torque is proportional to

a) speed b) $(\text{speed})^2$

c) $\frac{1}{\text{speed}}$ d) $\frac{1}{(\text{speed})^2}$.

ii) The free wheeling diode is needed with inductive load in

a) single phase half converter drive only

b) single phase semiconverter drive only

c) single phase full converter drive only

d) both single phase half converter drive & single phase full converter drive.

iii) Which of the following motors is preferred for fraction work ?

a) Universal motor b) D.C. series motor

c) Synchronous motor d) 3-phase induction motor.

iv) The ripple frequency is twice the supply frequency in the case of

a) single phase half wave converter

b) single phase dual converter

c) three phase full converter

d) three phase semiconverter.

v) In a 3-phase controlled bridge rectifier, with an increase of overlap angle, the output d.c. voltage

a) decreases b) increases

c) does not change d) depends on load inductance.

vi) Armature voltage control in a d.c. drives provides

a) constant power control b) constant speed control

c) constant torque control d) constant current control.

vii) Slip of Induction motor at the time plugging is

a) s b) 0

c) 1 d) $2-s$.

viii) Short time rating of an electric machine

a) is equal to the name plate rating

b) is less than the name plate rating

c) is greater than the name plate rating

d) has no bearing to its name plate rating.

ix) For an electric locomotive moving in the downward direction in a hilly region, the economic breaking system will be

a) counter current braking b) dynamic braking

c) regenerative braking d) mechanical breaking.

x) A typical active load is

a) hoist b) blower

c) pump d) friction.

xi) The speed & torque of induction motors can be varied by

a) Stator voltage control b) Rotor voltage control

c) Frequency control d) all of these.

xii) When a line commutated inverter operates in inverter mode

a) it draws both real & reactive power from *a.c.* supply

b) it delivers both real & reactive power to the supply

c) it delivers reactive power to *a.c.* supply

d) it draws reactive power from *a.c.* supply.

GROUP – B

(Short Answer Type Questions)

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

2. What is an electric drive ? How electric drives are classified ? 2 + 3

3. Describe with a neat diagram, form quadrant operation of a motor driving a hoist load.

4. Explain with the help of a schematic diagram, the method of speed control of a separately excited *dc* motor using a chopper.

5. Obtain the equilibrium points & determine their stability when motor & load torques are $T = -1 - 2w$ & $T_L = -3\sqrt{w}$.

6. Deduce the expression of energy loss during starting of a 3-phase induction motor.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

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

8. a) Explain equivalent current & power methods to determine the motor rating for intermittent loads.

   b) A motor driving a colliery winding equipment has to deliver a load, having the following characteristics :

      i) Rising uniformly from zero to maximum of 2000 kW in 20 sec during accelerating period.

      ii) 1000 kW for 40 sec during the full speed period

      iii) During the deceleration period of 10 sec, when regenerative braking is taking place, the power return to the supply falls from an initial value of 330 kW to zero.

   The interval of starting the next load cycle in 20 sec. What size of continuously rated motor would be suitable ? State the assumption made. 6 + 9

9. a) Explain how cycloconverter can be used to control the speed of induction motor.

   b) What do you mean by soft start ?

   c) Explain the principle of operation of vvvf control of induction motor. 6 + 2 + 7

10. a) What are the reasons for using load equalization in an electric drive ?

b) What are the characteristics that a traction motor should posses ? How does a *dc* series motor fit into such requirement ?

c) How energy loss during starting of a motor can be reduced ? 5 + 5 + 5

11. a) "A motor of smaller rating can be selected for an intermittent periodic duty." Justify the statement.

b) A motor has thermal heating time constant of 45 minutes. When the motor runs continuously at full load, its final temperature rise is 80°C.

i) What would be the temperature rise after 1 hour, if the motor runs continuously on full load ?

ii) If the temperature rise in 1 hour rating is 800°C, find the maximum steady state temperature of this rating.

iii) How long will the motor take for its temperature to rise from 500°C to 800°C, if it is working at its 1 hour rating ? 5 + 10

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

a) Self controlled synchronous motor drive

b) PWM inverter

c) Field weakening control of synchronous motor

d) Traction motor control.

END