B.E. (Electrical) (VII) (Rev.).   28/12/2007

Con. 5863-07.   Electrical Traction.   CD-7089

(REVISED COURSE)

(3 Hours)   [Total Marks : 100

N.B. (1) Attempt any **five** questions.
(2) Assume **additional** data if **necessary**. State the assumptions.

1. (a) What are the merits and demerits of electric traction over diesel electric and steam traction ?   5
   (b) Speed time characteristics for an express train between two stations is as follows :   15
       (i)   Uniform acceleration at 1 kmph/sec for 30 seconds.
       (ii) Uniform acceleration of 3 kmph/sec for next 30 seconds.
       (iii) 5 minutes run at constant speed.
       (iv) Braking at 3 kmph/sec for 20 secs.
       (v)   1 minute run at constant speed over a repaired section.
       (vi) Uniform acceleration at 3 kmph/sec for 20 seconds.
       (vii) Constant speed run for 2 minutes.
       (viii) Coasting at a retardation of 1 kmph/sec for 60 secs and braking for 30 secs till train comes to a half at station.
       Calculate :
           (i)   Speed at each transition point
           (ii) Retardation when train comes to a half
           (iii) Distance travelled.
       Draw speed-time characteristics.

2. (a) State the factors which affect the specific energy consumption.   5
   (b) A locomotive of 100 tonnes accelerates a train of 500 tonnes with an acceleration of   15
       1 kmph/sec over a upgradient of 10%. Adhesive weight of locomotive is 70% of dead weight. Tractive resistance is 45 N/T and rotational inertia is 10%. If this locomotive is helped by another locomotive of 130 tonnes with 100% adhesive weight, find :
           (i)   Train weight that can be hauled up the same gradient under same conditions.
           (ii) Maximum gradient, train weight remaining unchanged.
           (iii) Acceleration if train weight and gradient remain unchanged.

3. Write on the following :—   20
   (a) Weight transfer
   (b) Effect of unsprung mass and wheel diameter.

4. (a) Discuss merits and demerits of a 3 phase induction motor traction over a d.c. series motor   10
       traction drive.
   (b) Two motors each of 1500 V D.C. and armature resistance of 0·2 ohm, take 500 ampere   10
       during starting when connected in series. Effective train weight is 145 tonnes and dead weight is 130 tonnes. Specific resistance is 50 N/t, tractive effort per motor is 40000 newtons, speed at the end of starting period is 40 kmph. Find :
           (i)   Duration of starting period
           (ii) Speed of train at transition
           (iii) Loss during starting.

5. (a) What are different protection schemes for a a.c. locomotive.   10
   (b) Discuss the design parameters and constructional features for a traction motor to improve   10
       power to weight ratio.

6. Discuss the consideration for design of a OHE.   20

7. (a) Draw a layout of a 132/25 KV traction substation. Explain the function of different   10
       components in a traction substation.
   (b) Discuss traction control systems for 25 KV a.c. locomotive.   10