Time: 3 Hours **Marks: 80**

Note:- 1. Question No. 1 is compulsory
2. Attempt any **three** questions out of remaining **five** questions
3. Assume suitable data if necessary & justify the same
4. Figures to the right indicates marks

Qu.1	Attempt **any four**.	**Marks**
(a)	Discuss advantages of Electric traction over other system of traction.	**[5]**
(b)	Draw speed time curve of urban and suburban services	**[5]**
(c)	How DC series motor is most suitable for traction? Discuss	**[5]**
(d)	Write a brief note on sectionalizing paralleling post	**[5]**
(e)	Write a note on Kando system	**[5]**
Qu.2 (a)	Draw trapezoidal type speed time curve and derive the expression for distance travelled.	**[10]**
(b)	Draw 132/25 KV traction substation layout and discuss its operation in detail	**[10]**
Qu.3 (a)	Discuss the operation of DC traction using chopper controlled drive	**[10]**
(b)	Explain booster transformer with return conductor in detail.	**[10]**
Qu.4 (a)	Discuss the protection provided for transformer & overhead lines in traction .	**[10]**
(b)	Define the Tractive efforts. Derive the expression for total tractive efforts	**[10]**
Qu.5 (a)	An electric train weighing 500 tonnes climbs up gradient with G =8 and with following speed time curve 1. Uniform acceleration of 2.5 kmphps for 60 sec 2. Constant speed for 5 min 3. Coasting for 3 min 4. Dynamic braking at 3 kmphps to rest Train resistance is 25 N/tonne, rotational inertia effect 10% and combined efficiency of transmission motor & power modulator is 80 %. Calculate the Specific energy consumption	**[10]**
(b)	Explain the operation of power and auxiliary circuits use in traction	**[10]**
Qu.6 (a)	Discuss the current collection techniques used in overhead and underground system	**[10]**
(b)	Write a short note on DC and AC Track circuits	**[10]**

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