Paper solution :- T0548

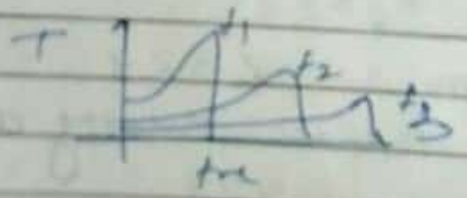
T10325 - TE Electronics & Electrical Engg. 01/7
- Sem 5, Rev-2012, CBSGS
T0548 - Electrical Machines - II soln

Q 1 a) Necessary conditions for parallel operⁿ :-

1) Polarities must be same
2) Voltage rating must be same
3) Phase sequence
4) Phase shift
5) $Z \propto \frac{1}{KVA}$

b) Operative Principle of 3 ϕ IM :-
Electromagnetic induction principle.

c) Effect of freq :-
If freq ↓ keeping Vtg const, one saturation of air gap flux take place.
If freq ↓ ⇒ X ↓ ⇒ Cln ↑
T ↑
$f_1 < f_2 < f_3$



d) Double Field Revolving Theory :-
Dia
Concept of 2 fields
RF with diagrams

Q6 b) • High torque I.M.

Deep Bar Cage motor
OR
Double Cage motor
} Any 1

① Diagram
② Construction
③ working

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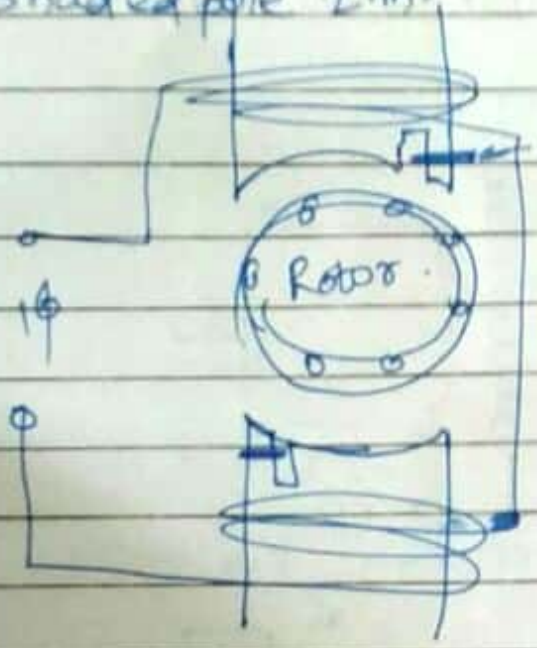
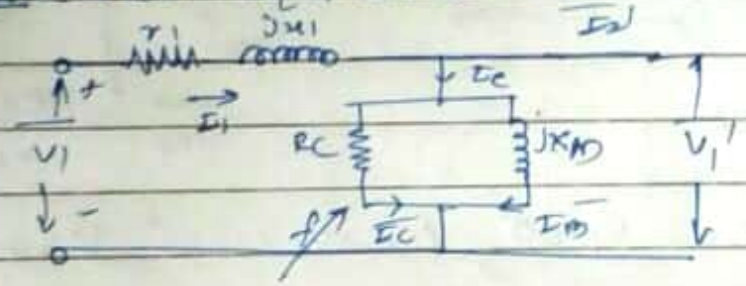
Q 4 a) Shaded pole 1.M:



- Self starting motor
- Construction
- Working :- show or explain resultant flux position in space

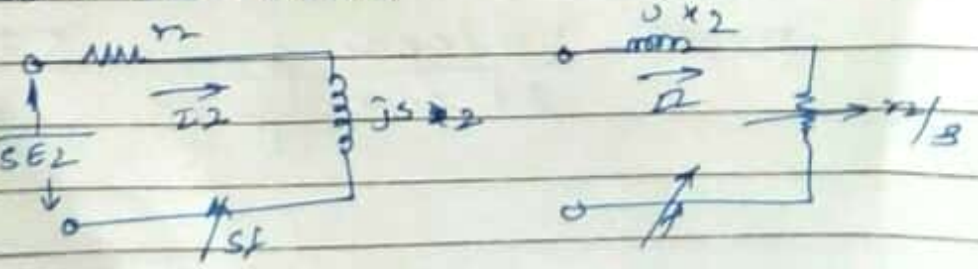
Q 4 b) Equivalent ckt of 3φ I.M.

(1) Stator Equivalent Ckt

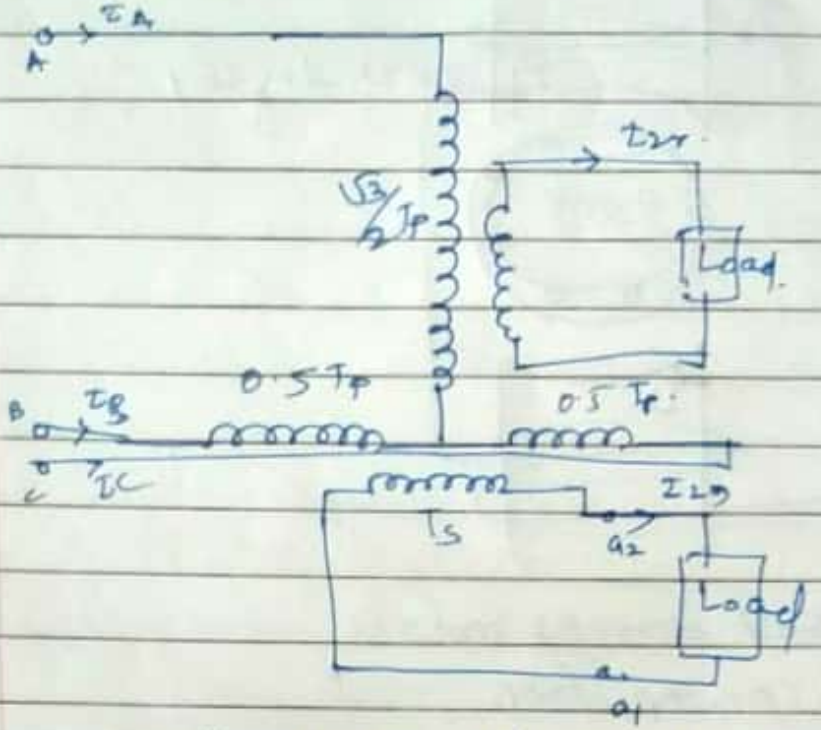


$$Rc = \frac{V_1'}{I_e}, \quad X_m = \frac{V_1'}{I_m}$$

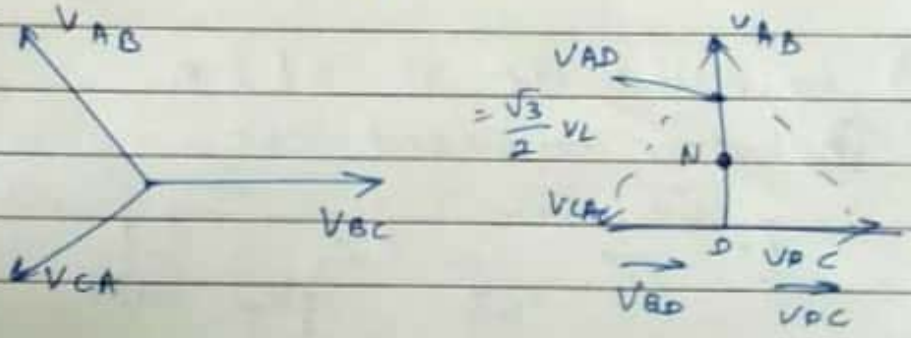
(2) Rotor ckt model



Q.3 a) Scott connection :- Dia.



- Explination about diagram
- phasor diagram



$V_{BC} = V_L \angle 0^\circ$, $V_{CA} = V_L \angle -120^\circ$, $V_{AD} = V_L \angle 120^\circ$

Prove :- $V_{AD} = 0.866\, V_L \angle 90^\circ$

b) Open delta :-

Diagram

prove $\frac{\text{VV capacity}}{\Delta\Delta \text{ capacity}} = 57.7\%$

22 a) Cogging :-

defn :- Magnetic locking — 3 marks

How to eleminate — skewed bar — 1 marks

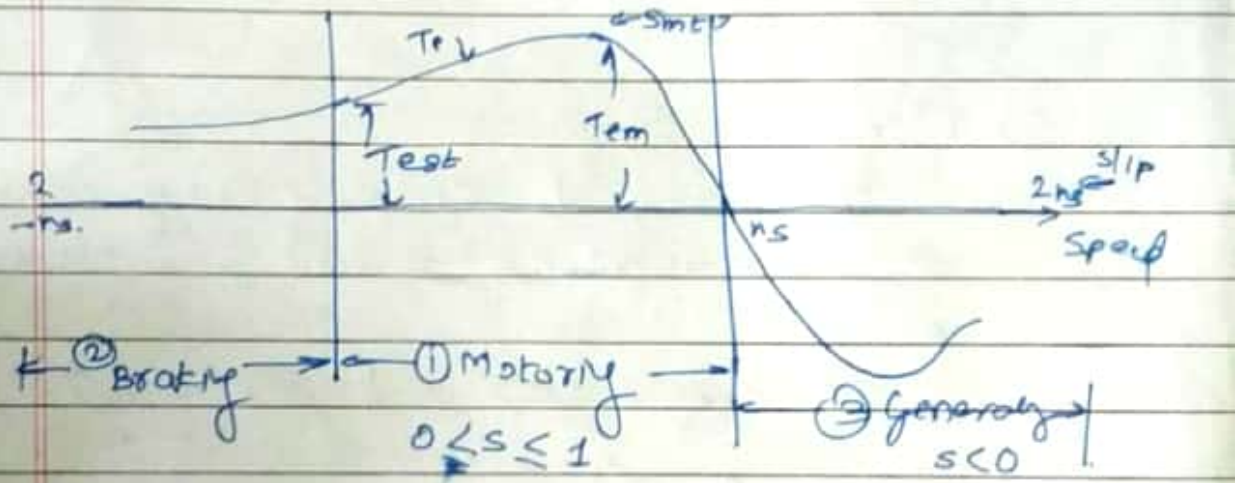
Crawling :- 6 Marks

defn :- — 2m

reason — 2m

diagram — 2m

22 b) Speed Torque chr.



① Motoring zone :- $0 < s \leq 1$

$N_r < N_s$, Motoring action

② Braking zone $s > 1$

plugging, motor must be disconnected.

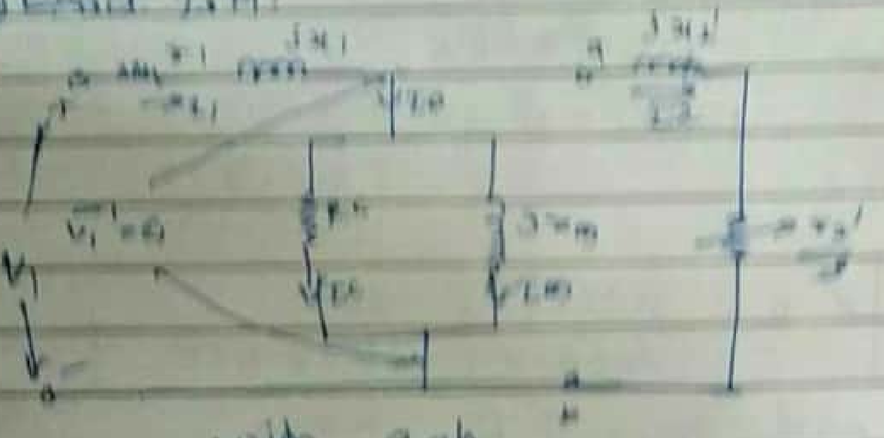
③ Generating zone $s < 0$

Voltage source is essential for generating mode.

Receives reactive power from supply mains

5/4

③ Exact T.M.:



with eqh.

Q5 a) 3 ϕ X^{mer} Groups
1) Group NO:- 1 = 0° phase shift
2) Group NO:- 2 = 180° Phase shift
3) Group NO:- 3 = -30° phase shift
4) Group NO:- 4 = 30° phase shift
Phasor group + connections

Q6 b) Base KVA = 1000

$Z_A = \frac{1000}{500} \times (0.004 + j0.018)$

$= 0.002 + j0.009$
$= 0.00922 \angle 77.47°$

$Z_B = 0.002 + j0.012$

$Z_A + Z_B = 0.004 + j0.021 \ \Omega$
$= 0.021377 \angle 79.215°$

Total. $Q = 1500 \angle \cos^{-1} 0.8$
$= 1500 \angle 36.87°$
$= 1200 - j900$

$$Q_B = Q \times \frac{Z_A}{Z_A + Z_B}$$

$$= 1500\angle -36.87 \times \frac{0.00922\angle 77.47^\circ}{0.02137\angle 79.215}$$

$$\boxed{Q_B = \frac{635.28\angle -38.61}{496.415 - j396.425}}$$

Load shared by x^mer A

$$Q_A = Q - Q_B$$
$$= 1200 - j900 - 496.415 - j396.425$$
$$= 703.585 - j503.575$$
$$= 865\angle -35.6$$

$\cos\phi_A = \cos 35.6 = 0.8131$ lag.
$\cos\phi_B = \cos 38.61 = 0.7814$ lag.

$Q_A = 865\angle -35.6^\circ$ KVA //

$Q_B = 635.28\angle -38.61^\circ$ KVA //

Q6a) Need of starter :-
- When started from rest, behaves like a 3ϕ x^mer with IIry shorted.
- If started heavy cln flows, damage the motor if it is flows for a long time due to high inertia of the rotor. Moreover a high cln will produce a more voltage drop in line.

Explain Any 1 starter in detail with dia & construction & working.