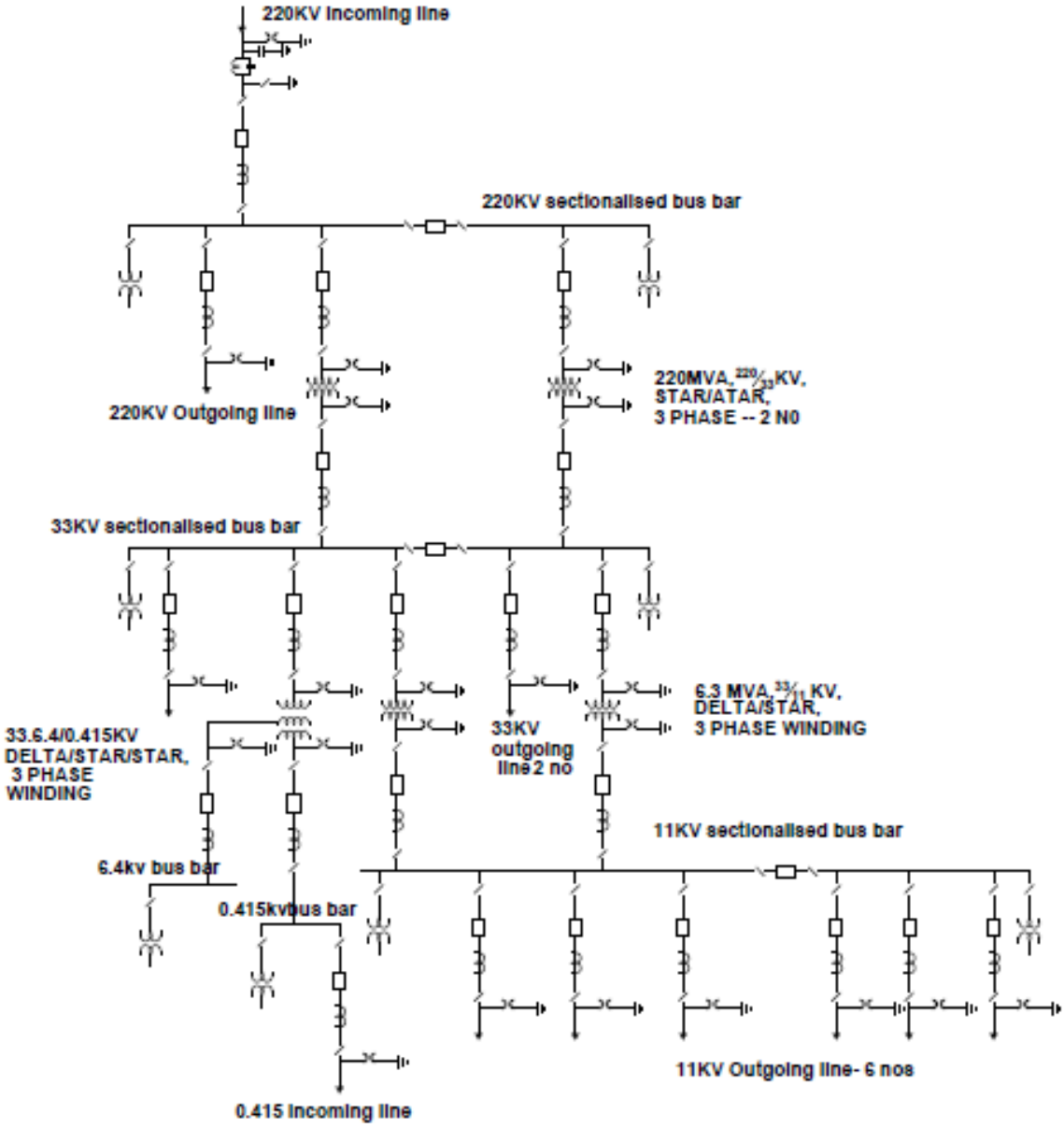
CMR INSTITUTE OF TECHNOLOGY	USN										

Internal Assesment Test – I- March 2017

Sub:	COMPUTER AIDED ELECTRICAL DRAWING						Code:	10EE65
Date:	30.03.2017	Duration:	90 mins	Max Marks:	50	Sem: 6	Branch:	EEE

Note: Q.1 is compulsory. Answer Q.2 OR Q.3.
Any missing data may be assumed, but must be stated clearly.
Use standard notations only. Neat sketches must be drawn wherever necessary.

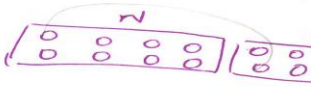
		Marks	OBE CO	OBE RBT
1)	Draw the single line diagram of 220/11 kV distribution substation having the following equipments : a. Incoming line: 220 kV-----1 no. b. Outgoing feeders : 11 kV---- 6 no's 220kV------ 1no 33kV---- 2 no's c. Transformers: 220MVA,220/33kV, Y/Y, 3-ph,50Hz--- 2no.s 6.3 MVA, 33/11 kV, Δ/ Y, 3-ph, 50 Hz-- 2no.s 33/6.4/0.415 kV, delta/star/star, 3 winding-- 1 no. d. Bus bars: 220 kV sectionalized single bus, 33 kV& 11 kV are sectionalized single bus, 6.4 kV, 0.415 kV are single bus e. Coupling condenser, wave trap, and earth switches are to be provided at incoming lines f. Indicate the position of CT, PT, IS, CB and LA.	20	CO605.1 & CO605.3	L2 L2
2)	Draw the developed winding diagram for a 16 slot, 4 pole, double layer, simplex, progressive lap winding. Show the equalizer ring connection. Draw the sequence diagram.	30	CO605.2	L2
	OR			
3)	Draw the developed DC wave winding diagram for the following data: slots = 20, poles = 4, single layer, simplex winding.	30	CO605.2	L2


220KV Incoming line
220KV sectionalised bus bar
220KV Outgoing line
220MVA, 220/33 KV, STAR/ATAR, 3 PHASE -- 2 N0
33KV sectionalised bus bar
6.3 MVA, 33/11 KV, DELTA/STAR, 3 PHASE WINDING
33.6.4/0.415KV DELTA/STAR/STAR, 3 PHASE WINDING
33KV outgoing line 2 no
11KV sectionalised bus bar
6.4kv bus bar
0.415kv bus bar
11KV Outgoing line- 6 nos
0.415 Incoming line

(2) Draw the developed winding diagram of 16 slots, 4 pole, double layer, Simplex, progressive lap winding.

(1) No: of slots / pole = 16/4 = 4 slots.

(2) No: of conductors / pole = 32/4 = 8 conductors



(3) $Y_b = Z/P \pm K$

$= 8 + 1$ [To have fullpitch coil].

$\therefore \boxed{Y_b = 9}$

(4) $Y_b - Y_f = \pm 2K$

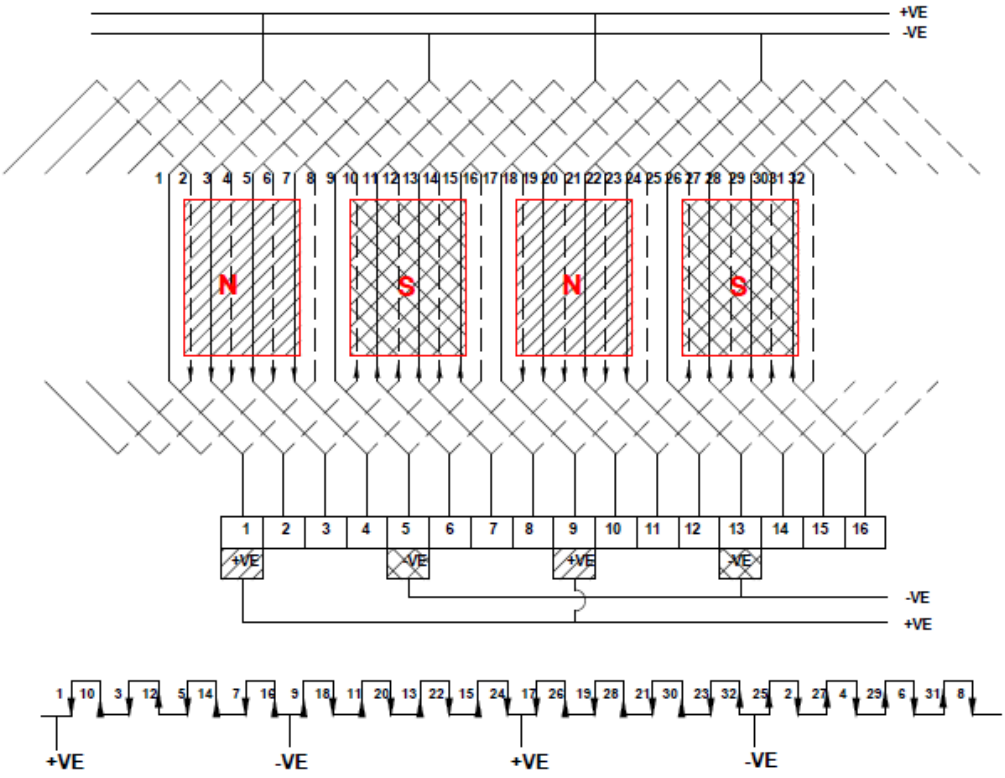
$9 - Y_f = 2$

$\therefore \boxed{Y_f = 7}$

(5) Winding table :-

1	10
3	12
5	14
7	16
9	18
11	20
13	22
15	24
17	26
19	28
21	30
23	32
25	2
27	4
29	6
31	8

Q2: 16 SLOTS, 4 POLE,DOUBLE LAYER, SIMPLEX, PROGRESSIVE LAP WINDING



(3) Draw the developed winding diagram for the following data
Slots : 20 ; Pole : 4, Single layer, simplex, Progressive wdg.

(1) No : of conductors = $S \times n$
$= 20 \times 1$ [n = Single layer = 1]

(2) $Y_c = \frac{Z \pm 2x}{P} = \frac{20 + 2}{4} = \frac{22}{4} = 5.5$

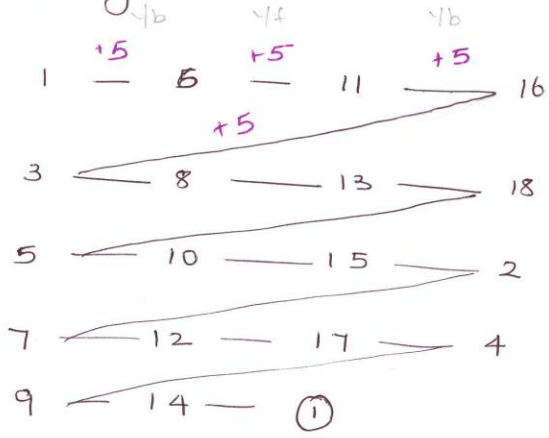
(3) Since it is a fractional consider 1 coil as dummy coil

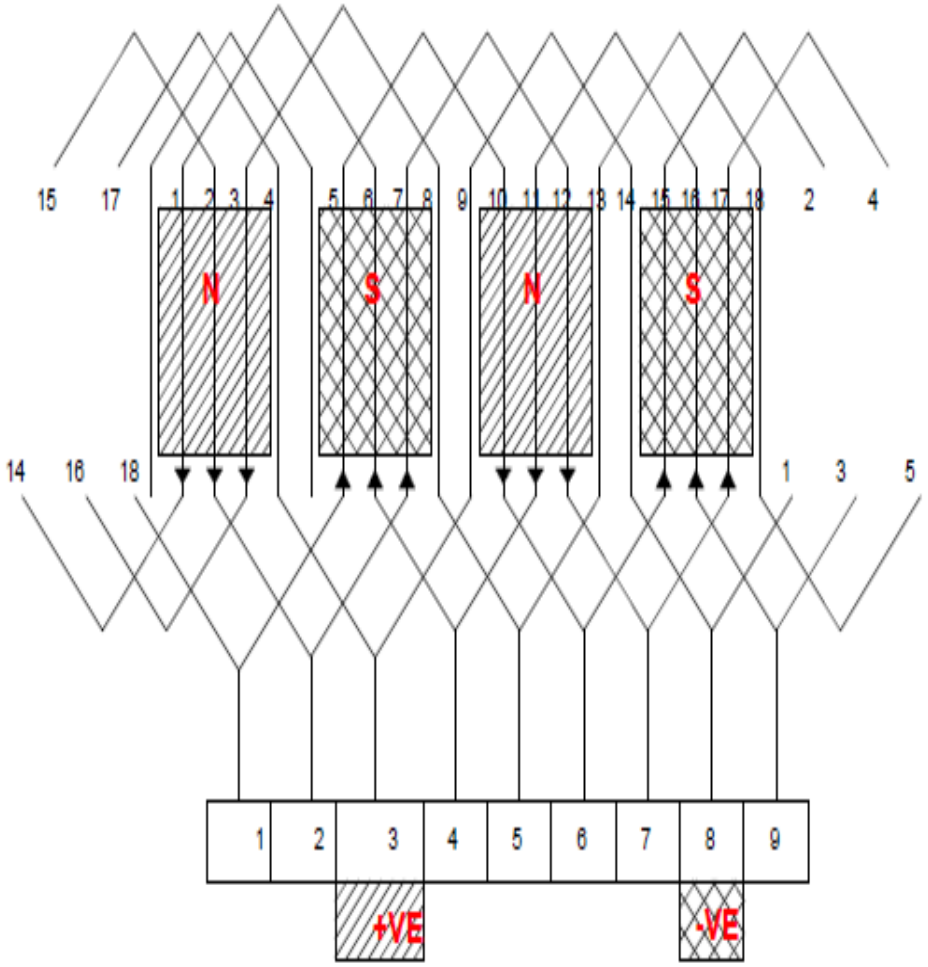
(4) ∴ No : of conductor = 20 − 2 = 18

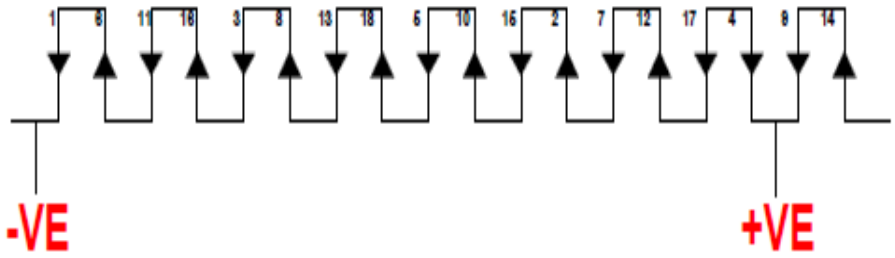
(5) $Y_c = \frac{18 + 2}{4} = \frac{20}{4} = 5$

(6) Y_c : 5 (odd integer) = Y_b : Y_f : 5

(7) Winding table:




15 17 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 2 4
N
S
N
S
14 16 18 1 3 5
1 2 3 4 5 6 7 8 9
+VE
-VE


1 6 11 16 3 8 13 18 5 10 15 2 7 12 17 4 9 14
-VE
+VE

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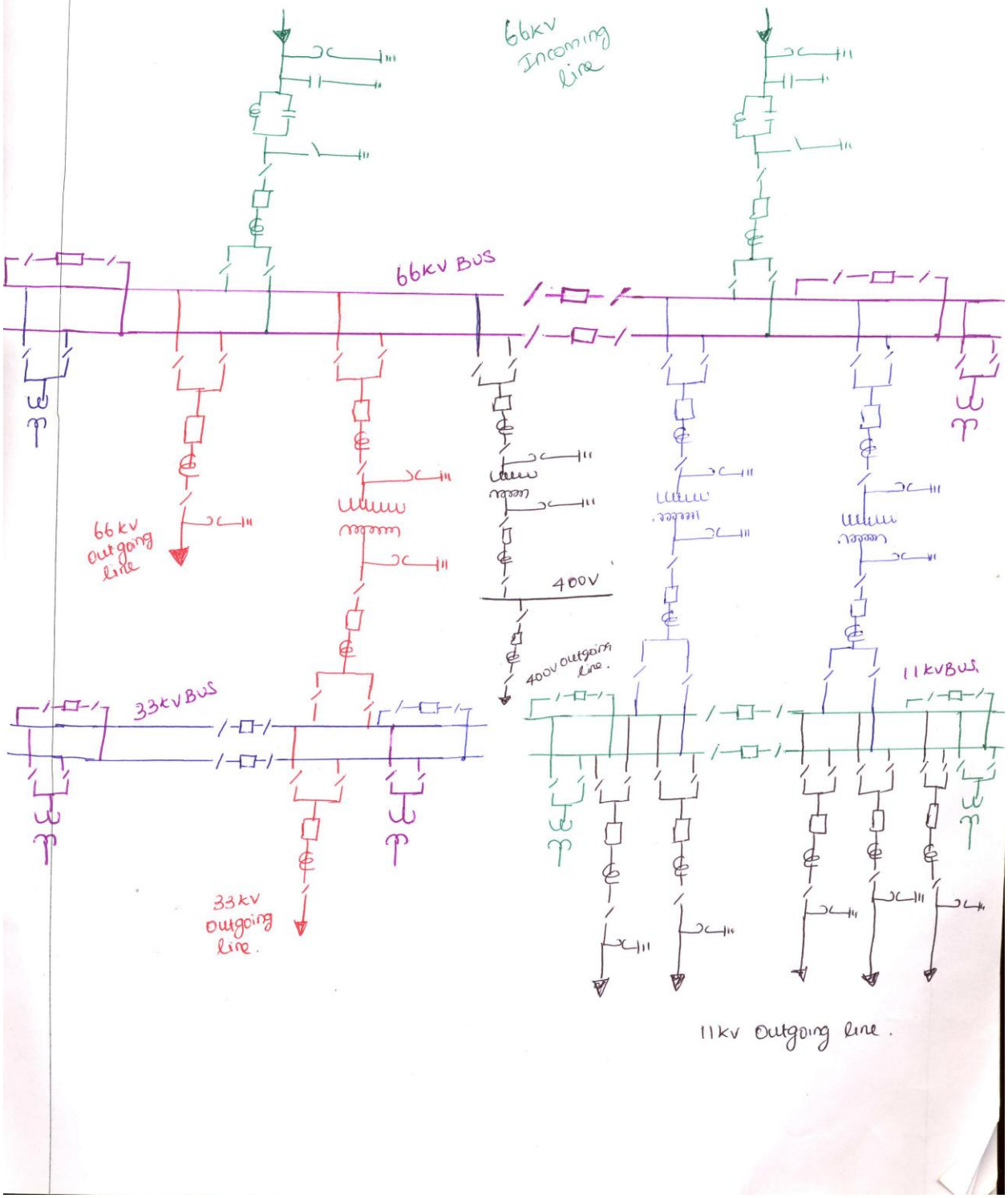
Any missing data may be assumed, but must be stated clearly.
Use standard notations only. Neat sketches must be drawn wherever necessary.

		Marks	OBE CO	OBE RBT
1)	Draw the single line diagram of a substation having the following equipments : a. Transformers : 5 MVA, 66/11 kV, delta/delta, 3-ph, 50 Hz-- 2no's 6 MVA, 66/33kV, delta/star, 3-ph, 50 HZ----1 no's b. Auxiliary station transformer: 500 kVA, 11 kV/400 V, delta/star, 3-ph, 50 Hz--- 1 no c. Incoming lines: 66 kV---- 2 no. d. Outgoing line: 66 kV----- 1 no, 33kV---- 1 no's, 11 kV----5 no's e. Bus bars : 66 kV ,33kV, 11 kV buses are Sectionalized double bus with bus coupler f. Coupling condenser, wave trap, and earth switches are to be provided at incoming lines g. Indicate the position of CT, PT, IS, CB and LA.	20	CO605.1 & CO605.3	L2 L2
2)	Draw the developed winding diagram for an 18 slot, 4 pole, double layer, duplex, progressive lap winding. Show the equalizer ring connection and Draw the sequence diagram.	30	CO605.2	L2
	OR			
3)	Draw a winding diagram for double layer, simplex retrogressive wave winding with 4 pole DC machine having 40 armature conductors. Draw the sequence diagram.	30	CO605.2	L2

① Draw the Single line Diagram of 66kv Substation.



(2) Draw the Developed winding diagram for an 18 slot, 4 Pole, double layer, duplex, progressive lap winding.

(1) No: of slots / pole = $18/4 = 4.5$

(2) No: of conductors = $S \times n = 18 \times 2 = 36$

(3) ∴ No: of conductors / pole = $36/4 = 9$

(4) $Y_b = Z/P \pm k$

$\boxed{Y_b = 9}$

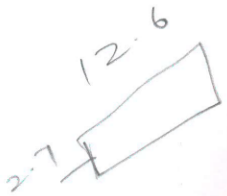
$Y_b - Y_f = +2 \cdot x$

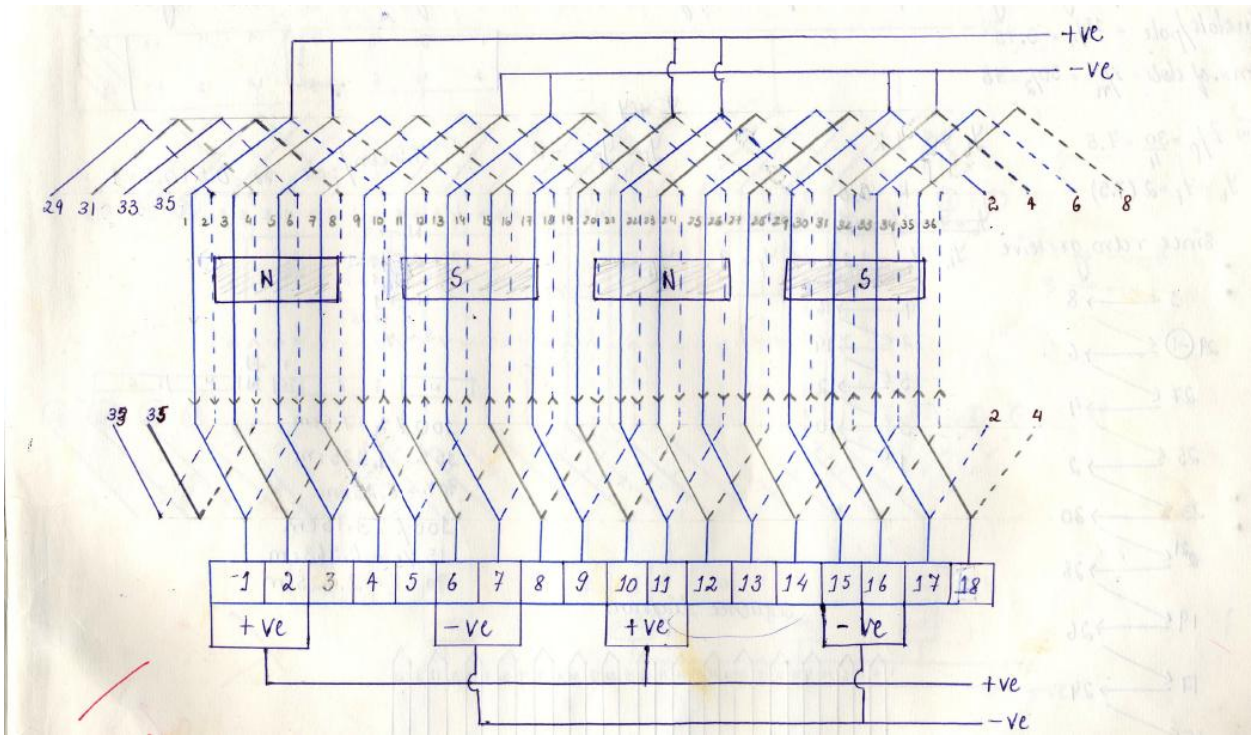
$Y_b - Y_f = 4$

$\boxed{Y_f = 5}$

(5) Winding table.

(1)		(3)	
1	10	3	12
5	14	7	16
9	18	11	20
13	22	15	24
17	26	19	28
21	30	23	32
25	34	27	36
29	2	31	4
33	6	35	8




+ve
-ve
29 31 33 35
2 4 6 8
N
S
N
S
33 35
2 4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
+ve
-ve
+ve
-ve
+ve
-ve

No of coils = 20, no of poles = 4, type - double layer simplex, retrogressive wave

(11)

$$Y_c = \frac{40-2}{4} = 9.5$$

new $Z = 40-2 = 38$

$$Y_c = \frac{38-2}{4} = 9$$

$$Y_b = Y_f = 9$$

1 → 10 → 19 → 28 → 37
8 ← 17 → 26 → 35
6 ← 15 → 24 → 33
4 ← 13 → 22 → 31
2 ← 11 → 20 → 29
38 ← 9 → 18 → 27
36 ← 7 → 16 → 25
34 ← 5 → 14 → 23
32 ← 3 → 12 → 21
30 ← 1

100% → 20
~~60%~~
70% → 14
15% → 3
~~[illegible]~~
75% → 20 → 15

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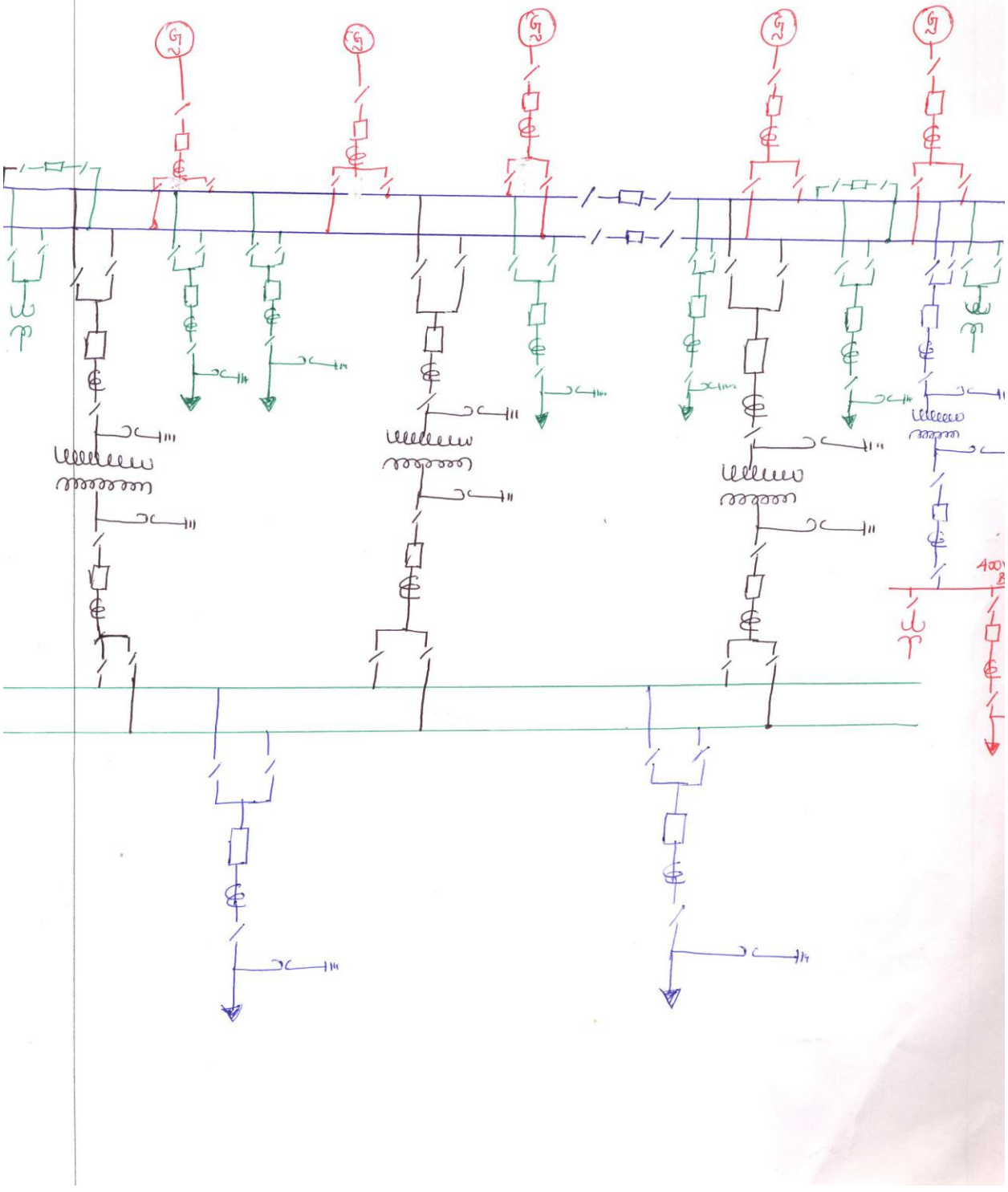
		Marks	OBE CO	OBE RBT
1)	Draw the Single line Diagram of a Generating station having the following details a) Generators: 50MVA, 11 kV, 3 phase, 50HZ, ----- 5 nos b) Transformers: .50MVA, 11/132 kV, 3 phase, ----- 2no's c) Transformer (auxiliary): 500kVA, 11000/400V, ----- 2 no's d) Transformers (reverse): 1MVA 132/11kV, -------1 no's e) Bus bars : 132 kV double bus bar, 11 kV double bus sectionalized with bus coupler, 400V single bus f) Outgoing lines:132kV------2no's,11kV --- 5 no, 400v --- 1no, g) Also indicate positions of CT, PT, Isolating Switches, Lightning arrestors and circuit breakers.	20	CO605.1 & CO605.3	L2 L2
2)	Draw the developed winding diagram for a 14 slot, 4 pole, double layer, simplex, progressive lap Winding. Show the equalizer ring connection. Draw the sequence diagram.	30	CO605.2	L2
	OR			
3)	Draw the developed DC wave winding diagram for the following data: slots =18, poles = 4, double Layer, duplex winding. Draw the sequence diagram and show the brush position.	30	CO605.2	L2

Draw single line diagram of a Generating station:



(2) Draw the developed winding diagram for a 14 slot, 4 pole, double layer, Simplex, Progressive lap winding.

(1) No: of Slots $= 14/4 = 3.5$

(2) No: of conductors $= 14 \times 2 = 28$

$\therefore$ conductors/pole $= 28/4 = 7$

(3) $Y_b = Z/P \pm k$

$\boxed{Y_b = 7}$

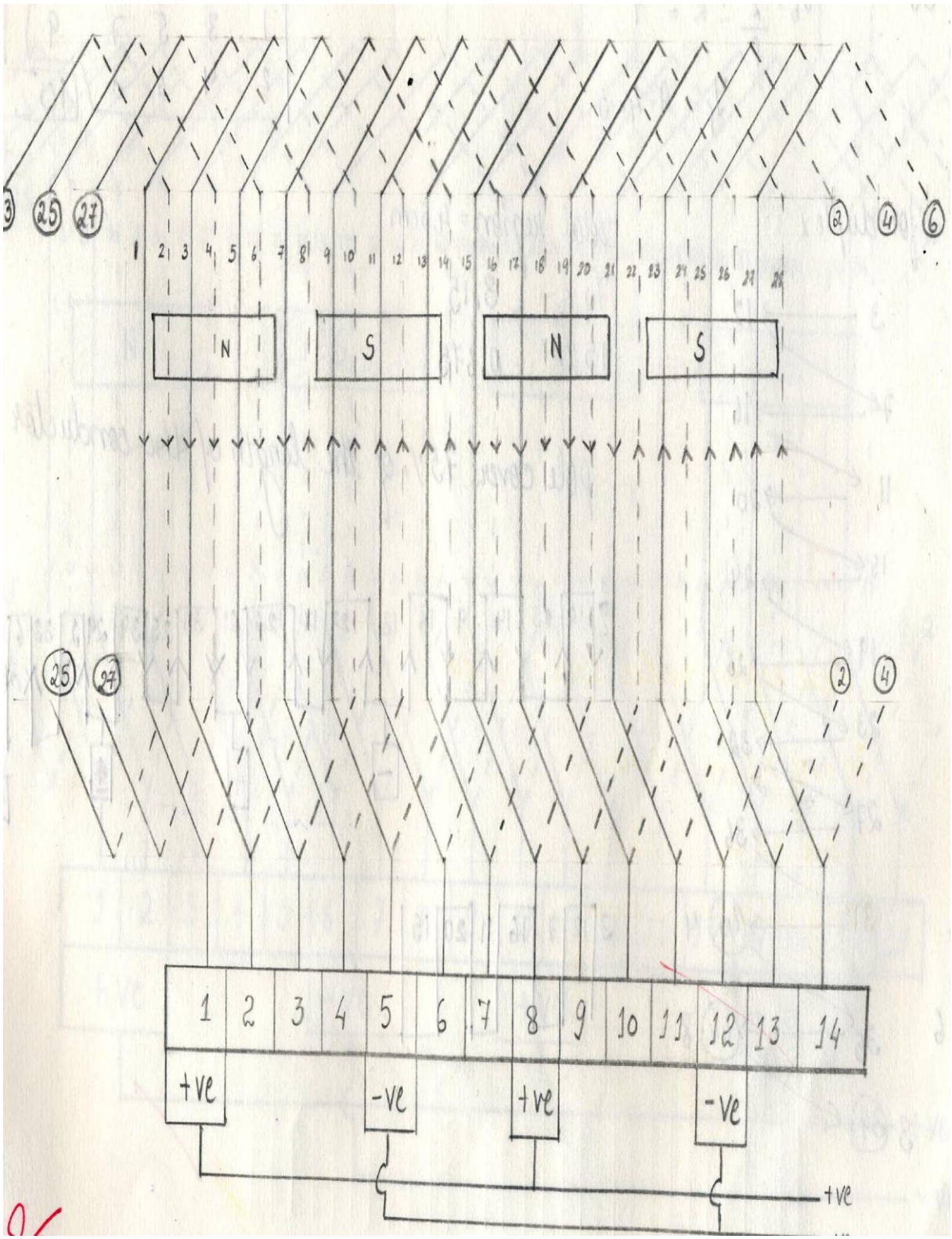
$Y_b - Y_f = +2.x \Rightarrow y_b - y_f = 2 \Rightarrow 7 - y_f = 2$

$\boxed{Y_f = 5}$

(4) $Y_b = 7$; $Y_f = 5$

(5) Winding table:

1 — 8
3 — 10
5 — 12
7 — 14
9 — 16
11 — 18
13 — 20
15 — 22
17 — 24
19 — 26
21 — 28
23 — 2
25 — 4
27 — 6
29 — 1


N
S
N
S
1 2 3 4 5 6 7 8 9 10 11 12 13 14
+ve
-ve
+ve
-ve
+ve

③ Draw the Developed winding diagram for the fibowing data.
Slots = 18 Pole = 4 double layer, duplex, winding.

① No: of Slots/p = 18/4 = 4.5.

② No: of Conductors = 18 × 2 = 36

③ $Y_c = \frac{Z \pm 2}{P} = \frac{36 \pm 4}{4} = \frac{40}{4} = 10$

④ $Y_c = 10$ [even Integer]

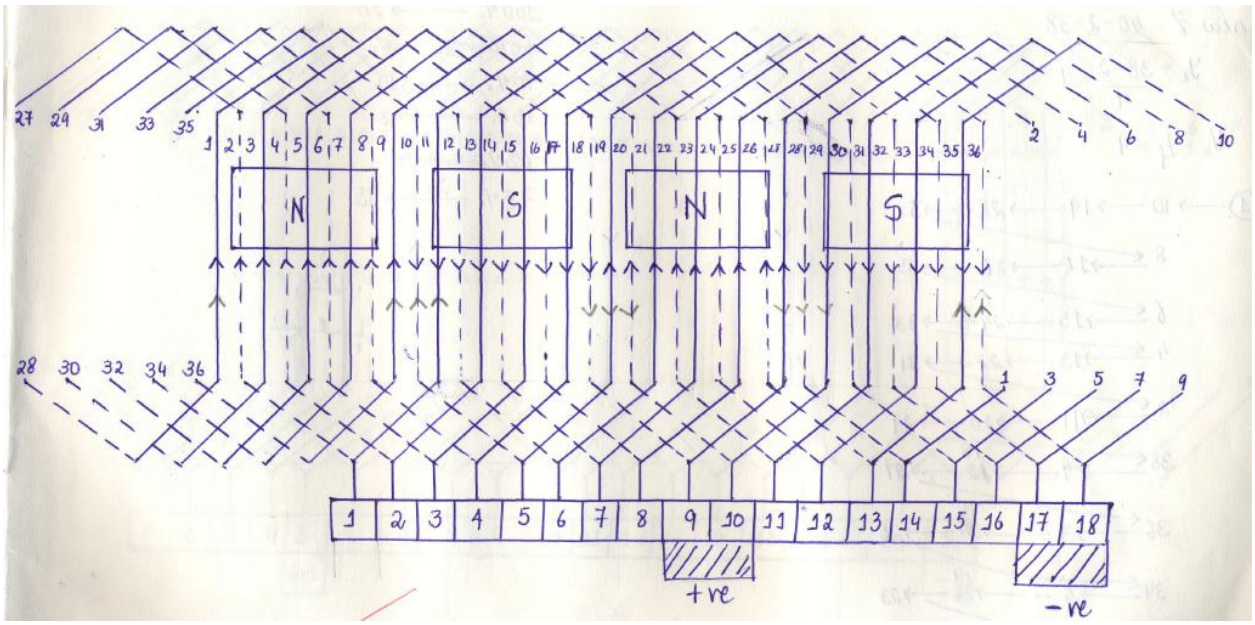
$\therefore Y_b = Y_c + 1 = 10 + 1 = 11$

$Y_f = Y_b - 2 = 11 - 2 = 9$

$\therefore Y_b = 11$; $Y_f = 9$

Winding table:

1	12	21	32
5	16	25	36
9	20	29	4
13	24	33	8
17	28	①	
3	14	23	34
7	18	27	2
11	22	31	6
15	26	35	10
19	30	③	


N
S
N
S
+ve
-ve