Q2. A simply supported R.C.C beam has
Size of beam = 300 mm x 500mm
Clear span = 4.6 m
Bearing = 300 mm, wall thickness = 400mm
Main reinforcement = 3-20mm ϕ bars of mild steel
(out of which one bar is bent up. at $\frac{l}{7}$ from centre of support.)
Vertical Stirrups = 8mm ϕ 2 lygsed @ 200 mm c/c
Anchor bars = 2-12 mm ϕ
Draw to a suitable scale the longitudinal section & two cross sections.

Soln → Clear cover = 20mm = End cover

Total length of beam = Clear span + Bearing + Bearing
= 4600 + 300 + 300
= 5200mm

(i) Length of straight bar = Total length - 2x End cover + 2 x 9ϕ (for hooks in both side steel)
= 5200 - 2x20 + 2x9x20
= 5520mm

(ii) Length of anchor bar = Total length of beam - 2 x End cover
(Hooks not provided in anchor bars) = 5200 - 2x20
= 5160 mm

H = D − 2× Clear cover − 2× dia of stirrup − Dia of bent up bar

= 500 − 2×20 − 2×8 − 20

H = 424 mm

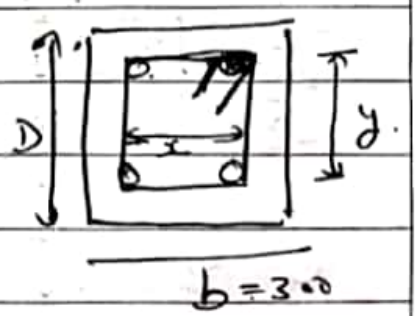
(iii) Length of Bent up bar = Length of straight bar + 2×0.42H

= 5520 + 2×0.42×424 = **5876 mm**

x = b − 2× clear cover − 2× dia of stirrup

= 300 − 2×20 − 2×8

= 244



y = D − 2× Clear cover − 2× dia of stirrups

= 500 − 2×20 − 2×8

= 444 mm

(iv) Length of one stirrup

= 2(x+y) + 16 ϕ (dia of stirrups)

= 2(244+444) + 16×8

= 1504 mm

(v) No of stirrups = $\frac{\text{c/c bearing}}{\text{spacing}} + 1$

= $\frac{4900}{200} + 1$ = **26**

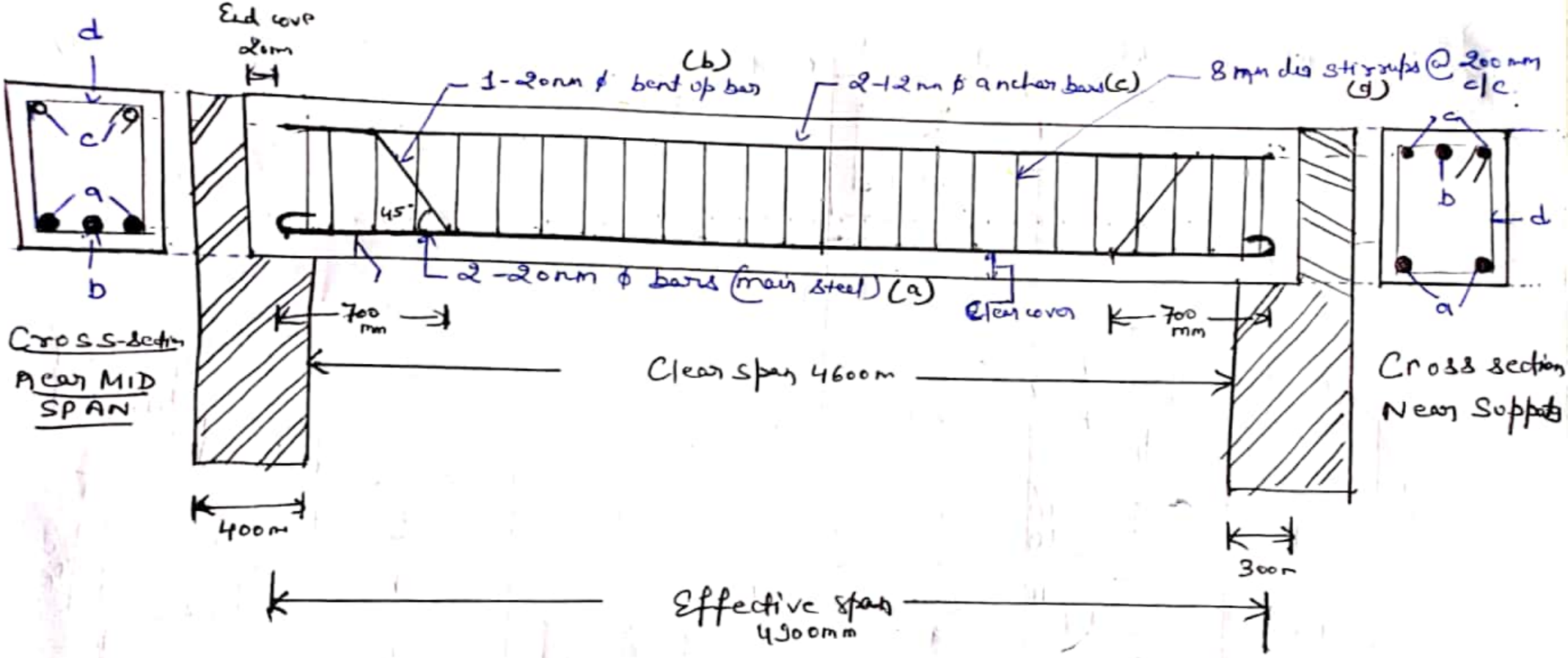
Bar-bending schedule

S.No	Type of bar	Diameter (mm)	Shape of bar	No	Length (mm)	(P) Total length (m)	(Q) W/m $\frac{D^2}{162}$ kg/m (D = dia of bar)	(P × Q) Total wt kg.
1.	Main Steel (i) Straight bar	20		2	5520	11.04	$\frac{20^2}{162} = 2.47$	27.27
	(ii) Bent up	20		1	5876	5.876	$\frac{20^2}{162} = 2.47$	14.51
2.	Anchor bar	12		02	5160	10.32	$\frac{12^2}{162} = 0.89$	9.18
3.	Shear stirrup	8		26	1504	39.10	$\frac{8^2}{162} = 0.39$	15.25
								66.21 kg

Total wt = 66.21 kg.

Add 5% wastage = 3.31 kg

Gross wt = 69.52 kg



Longituderal Section or L-Section

a - Main Steel

b - Bent up bars

c - Anchor bar

d - Shear Stirrups

Q3 Draw to a suitable scale L-section & cross section of a simply supported R.C.C beam with details.

Size = 300 x 1000 mm

Clear span = 7m

Bearing on wall = 500 mm

Main reinforcement = 4 no - 20 mm ϕ

Side face reinforcement = 2 - 12 mm ϕ on each face.

Anchor bars = 2no - 12 mm ϕ

Shear Stirrups = 8 mm ϕ 2 legged @ 200 mm c/c

Also prepare Bar bending schedule.

Soln. Assume Fe415D Steel used

Clear cover = 20 mm

End cover = 40 mm ∑ could be taken also 20

1) Total length of beam = Clear span + Bearing + Bearing

= 7000 + 500 + 500 = 8000 mm

2) Length of main straight bar = Total length of beam - 2 x End cover

= 8000 - 2 x 40 = 7920 mm

3) Length of anchor bar = Length of straight bar

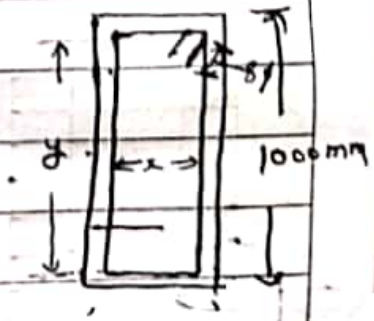
= 7920 mm

Note:- As the depth of the beam is 1000 mm which is greater than 750 mm so should be considered as deep beam.
In deep beam side face reinforcement must be provided with a max^{m} spacing limited to 300mm

4) Length of side face reinforcement = length of main straight bar
= 7920mm

x = b − 2 × clear cover − 2 × dia of stirrup bar
= 300 − 2×20 − 2×8 = 244mm

y = D − 2 × clear cover − 2 × dia of stirrups
= 1000 − 2×20 − 2×8 = 944mm

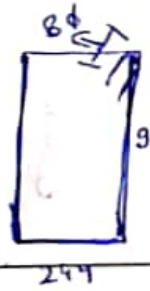


5) Length of one stirrup
= 2(x+y) + 16 ϕ
= 2(244+944) + 16×8
= 2504mm

15/23

6) No of stirrups = $\frac{\text{Effective span of beam (c/c bearing or)}}{\text{Spacing of stirrups}} + 1$
= $\frac{7500}{200} + 1 = 39$

Bar-bending Schedule

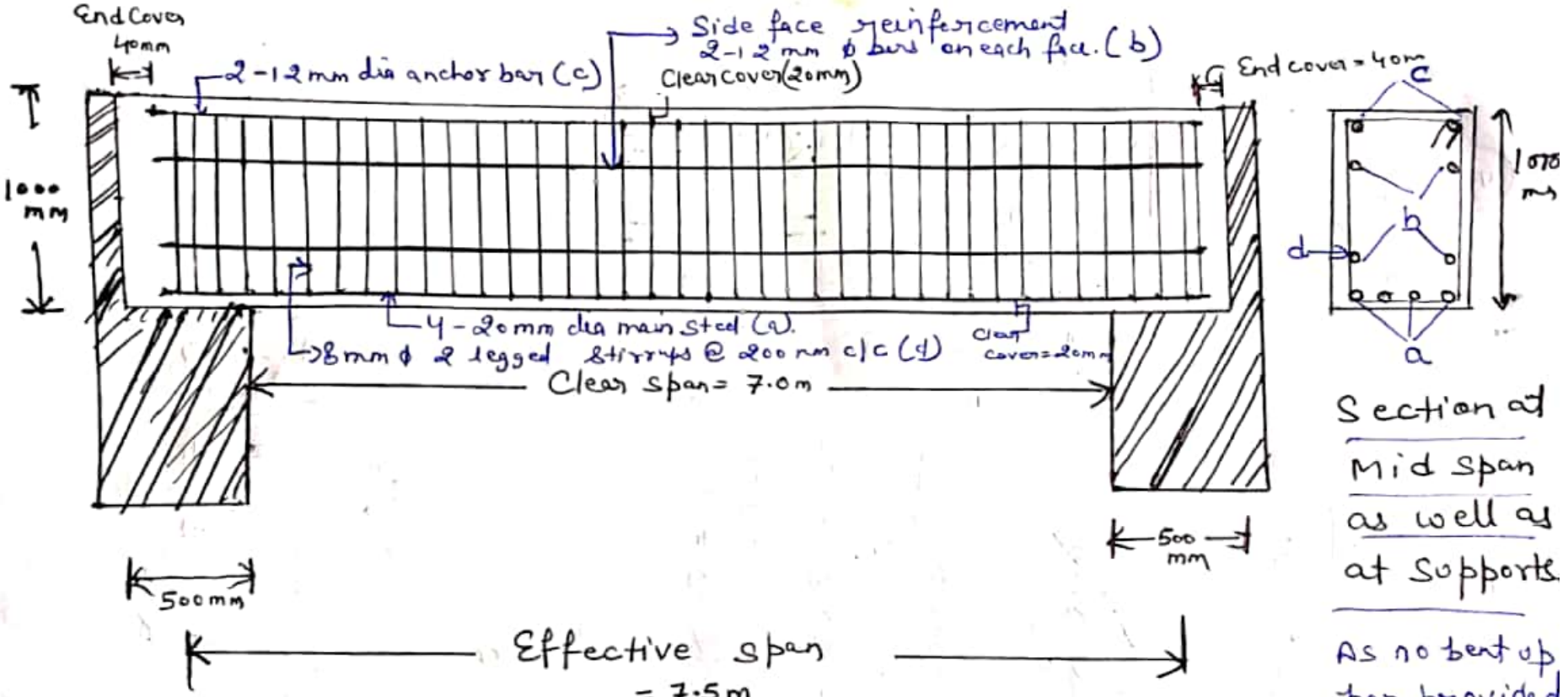
S.No	Type of bar	Dia (mm)	Shape of bar	No	Length (mm)	Total length (cm)	W/m kg/m	Total weight
1.	Main bar(a)	20	——	04	7920	31.68	2.47	78.25
2.	Side face(b) reinforcement	12	——	2+2=4	7920	31.68	0.89	28.20
3.	Anchor bars (c)	12	——	02	7920	15.84	0.89	14.10
4.	Shear stirrups (d)	8		39	2504	97.66	0.39	38.08

Total weight of steel = 158.63 kg

158.63 kg

Add 5% wastage = 7.93

Gross weight of steel = 166.56 kg.



Simply Supported Deep beam