Final Term

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Subject : PRCD-1

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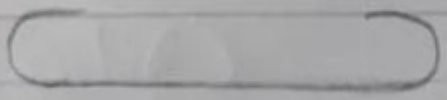
Section : B

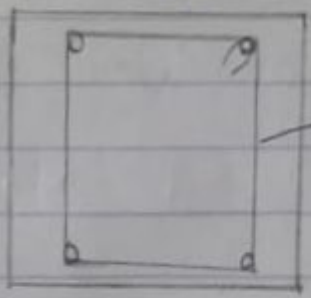
Q 1
Ans Stirrup:- Stirrups are close-loop bars tied at regular intervals in beam to hold the bars in position.

Types of Stirrups:-

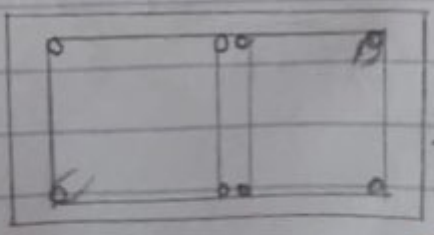
1. Single legged Stirrup:- The Single-leg Stirrups have rarely been used because they are mostly used when binding only two rods.



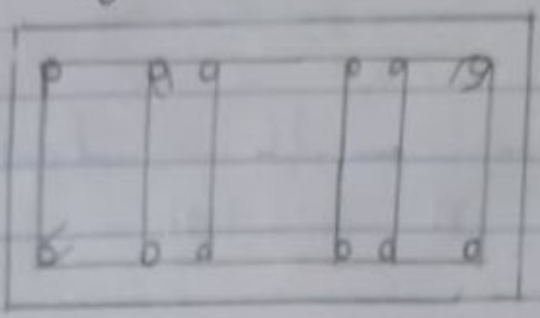
(2) Two legged Stirrup:- It is most commonly and widely used Stirrup. Minimum 4 bars are required for providing this Stirrup.



(3) Four legged stirrup:- These Stirrups are used in case of Web reinforcement.



(4) Six legged Stirrup:-



ACI Codes for shear Design of a Beam:-

According to ACI-318, following are the formulas used for the shear design of a Beam.

1) Critical Section:- Critical section at 45° and equal to effective depth.

2) Shear strength capacity of concreate is:-

$$Vc = 2 \times \sqrt{f'c} \times bw \times d$$

(3) Minimum Web reinforcement:-

$$Aumin = 0.75 \times \frac{\sqrt{f'c} \times bw \times s}{fy} \text{ or } \frac{50 \times bw \times s}{fy}$$ [Higher value is selected]

By interchanging the above formulas we can obtain the formula for maximum spacing.

$$S_{max} = \frac{Au \times fy}{0.75 \times \sqrt{f'c} \times bw} \text{ or } \frac{Au \times fy}{50 \times bw}$$ [lesser value is selected]

(4) No Web-reinforcemen is required if

$$Vu < \frac{1}{2} \phi Vc$$

-> B/w Critical section "Vu" and "ϕVc" Spacing b/w Web reinforcement can be find as

$$S = \frac{\phi \times Au \times fy \times d}{Vu - \phi Vc}$$

(5) if $Vs \leq 4 \times \sqrt{f'c} \times bw \times d$, then max spacing for stirrups will be smallest of the following:-

1) 24"
2) d/2
3) $S_{max} = \frac{Au \times fy}{0.75 \times \sqrt{f'c} \times bw}$
4) $S_{max} = \frac{Av \times fy}{50 \times bw}$

=> If $Vs > 4 \times \sqrt{f'c} \times bw \times d$

Max: spacing will be haved

=> If $Vs > 8 \times \sqrt{f'c} \times bw \times d$

Then either increase cross-sectional dimensions or increase f'c.