PNS SCHOOL OF ENGINEERING & TECHNOLOGY

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Internal Assessment Examination – 2023 (4th Semester)

Sub-STRUCTURAL DESIGN-1

Branch – Civil Engineering

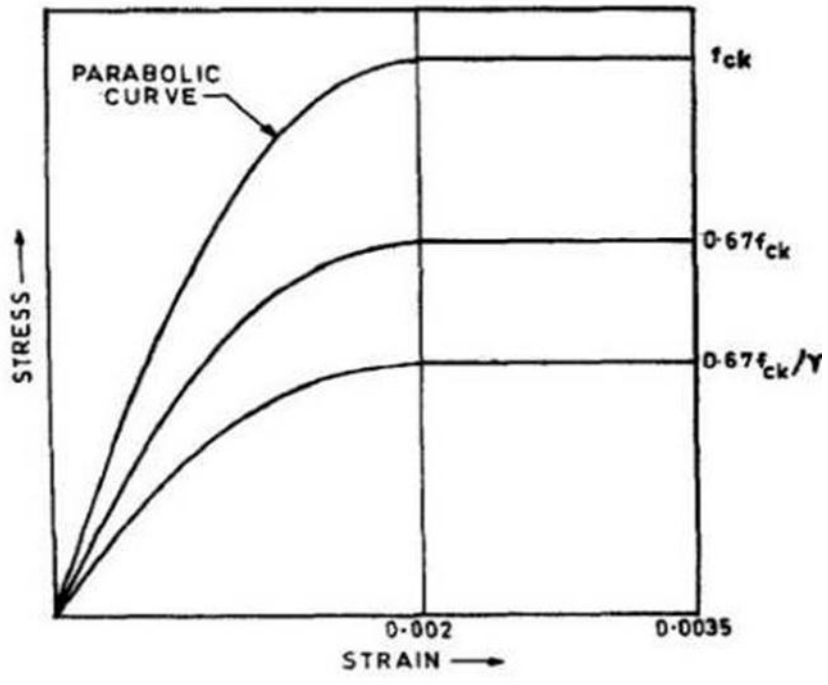
Time: 1.5 Hours

NO-1

(a)What is factor of safety?

factor of safety is ability of a system's structural capacity to be viable beyond its expected or actual loads. for concrete 1.5 and for steel 1.15.

(b)Draw stress-strain diagram of concrete?



STRESS-STRAIN CURVE FOR CONCRETE

(c)What is leverarm? Write down the formulae for leverarm ?

The leverarm is the perpendicular distance between the line of action of the couple forming compressive and tensile forces in a reinforced concrete section.lever arm=(d-0.42x_u-).

(d)What are the assumptions in limit state of collapse?

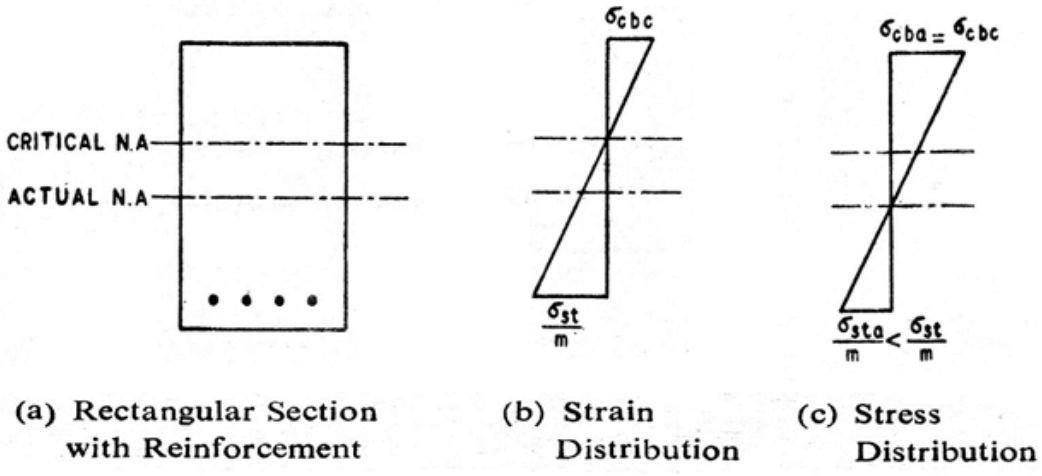
(1)maximum compressivestrain in the outermost fibre is taken as 0.0035.(2)tensile strength of concrete is neglected.(3)for design purpose design strength of steel is taken as 0.87f_y .

(e)Write down the formulae for moment of resistancer both for compression as well as tension.

M_C=0.36fckx_ub (d-0.42x_u) OR M_T= 0.87 fyAst(d-0.42x_u).

2.(a) What is underreinforced section,overreinforced section and balanced section? Explain with neat sketch.

Ans:



Balanced section:the stresses in concrete and steel reach to permissible values at the same time.

Underreinforced section: reinforcement available in the beam is less than that of a balanced section.

Overreinforced section:steel in the section is more than that required in a balanced section.failure is in concrete causes a brittle faiure without any prior warning.as per limit state method of design of over reinforced section should be avoided.

(b)Determine the depth of N.A of a beam section of size(250X400)mm reinforced with 3-20mm diameter of bars ofFe 250 and M20 concrete.The nominal cover to reinforcementis 40mm.

Ans:

Ast=942.5mm^2

b=250mm, d=400-50=350mm

x_{ulim} =0.53*d=185.6mm

x_u=0.87fyAst/0.36fckb

=0.87*250*942.5/0.36*20*250

=113.26 $X_U < X_{Ulim}$(under-reinforced section)

(c)Determine the leverarm for a rectangular beamof size(300X450)mm with 50 mm effective cover reinforced with 4-20mm dia bars of Fe415 and concrete M_{25}.

Ans:

$z=d-0.42x_u$

B=300 ,D=450

D=400mm

Ast=1256.64mm^2

X_U=0.87*415*1256.64/0.36*20*300

=167.11mm

Z=400-(0.42*167.11)=330.48mm