JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- MAY-2023

COURSE CODE (CREDITS): 12M1WCE231 (3)

COURSE NAME: PRESTRESSED CONCRTE DESIGN

COURSE INSTRUCTORS: Dr. Saurav

MAX. MARKS: 25

MAX. TIME: 1 Hour 30 Minutes

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. Design a simply supported prestressed concrete slab to the following conditions   [6, CO4]

Span of the slab: 12m ,

Safe stress in concrete: 14N/mm²

Safe stress in steel: 900 N/mm²,

Superimposed load: 20 kN/m²

Weight of PSC: 24 kN/m³

Q2. Discuss various stages of loadings to be considered in design of prestressed member. What are various criteria's to be considered for condition at failure?   [4, CO3]

Q3. A prestressed concrete beam 250mm ×300mm is initially prestressed by 450kN at an eccentricity of 60mm. The beam has a span of 5.75m and has to carry a superimposed load of 7.5kN/m. Analyse the beam section for the stresses produced at mid span before and after application of the live load. Allow a loss of 15%. Unit of concrete is 24kN/m³.   [4, CO2]

Q4. A post tensioned prestressed concrete beam of 16m span is subjected to an initial prestress of 1458kN transferred at 28days strength of concrete. Profile of the cable is parabolic with the maximum eccentricity of 520mm at the centre of the span. Take the following additional data   [6, CO3]

A= 2.42 ×10⁵ mm²

A_s= 1386 mm²

E_s= 2.1 ×10⁵ N/mm²

I= 5.3 ×10¹⁰ mm⁴

σ_s= 1059 N/mm² at transfer E_c= 0.382 ×10⁵ N/mm²

μ= 0.25

k= 0.0015 per meter

anchorage slip= 2.5mm

Determine the losses in prestress and tabulate the results. Determine the effect of strain due to flexure caused by an external load of 30kN/m acting on the beam on losses. Jacking is done from both ends of the beam. Estimate the net loss of prestress. Assume dead load of concrete= 24000 N/m³.

Q5. A prestressed beam has a symmetrical I section in which the depth of each flange is 1/5th of the overall depth and the web is thin enough to be neglected in bending calculations. At the point of maximum bending moment, the prestressing force is located at the centre of the bottom flange and the total loss of prestress is 20%. If there is no tensile stress in the concrete at any time, show that the dead load must be at least 1/7th of the live load.   [5, CO3-4]