B. Construction Engineering 3rd year 2nd semester supplementary Examination – 2023

Subject: Precast & Prestressed Concrete

**Total Time: Three hours**

**Full Marks: 100**

*PART-I(Full Marks-50)*

*Use Separate answer sheet for each part.*

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| CO1 [10] | [1] Answer any two from (a) –(c) in this block<br>a. Prestress concrete & advantages of Pre stress concrete<br>b. Pre tensioning & post tensioning<br>c. Proof stress and creep coefficient. |
| CO2 [15] | [2]A rectangular concrete beam of cross section 50cm deep &20 cm wide is prestressed by means of 18 wires of 5mm dia located 7 cm from the bottom of the beam & 3 wires of diameter of 5mm , 4 cm from the top. Assuming the prestressed in the steel as 1050 $N/mm^2$. Calculate the stresses at the extreme fibres of the mid span section when the beam is supporting its own weight over a span of 7m. take UDL= 15KN/m. density of concrete= $24KN/m^3$ [15] |
| CO3 [10] | [3]. A rectangular concrete beam of cross section of 500× 250 is prestressed by means of 18 wires of 5mm dia located 7 cm from the bottom of the beam & 3 wires of diameter of 5mm , 4 cm from the top. Assuming the prestressed in the steel as 1050 $N/mm^2$. Calculate the percentage loss of stress in steel due to elastic deformation of concrete.[10] |
| CO4 [15] | *[4]:*<br>(a) A Prestress concrete beam of rectangular section 300 mm wide and 600 mm deep spans over 10m. the beam is prestressed by a straight cable carrying an effective force of 400 KN at an eccentricity of 50 mm. if its supports an imposed load of 8KN/m and the modulus of elasticity of concrete is $38KN/mm^2$, compute the deflection at the following stages and check whether they comply with the IS Code specification.(i)Upward deflection under (Prestress + self-weight) (CO4),(ii)Final downward deflection under (Prestress+ Self-weight + imposed load) including the effects of creep and shrinkage. Assume the creep coefficient to be 1.80 [15]. |

**CO1:** **Explain and describe** Precast elements, Joints and connections. Composite precast elements, methods of prestressing (K1)

**CO2:** **Explain** Partial prestressing, composite construction.(K2)

**CO3:** **Classify and describe,**Losses of prestress(K2)

CO4: **Clarify and solve** Anchorage zone stresses, prestressed containers of systems.Solve problems regarding determinate and indeterminate structures (K3)

**CO5:** IllustrateTwo way prestressing, circular prestressing **(K3)**

[ Turn over

**Ref: Ex/CON/PC/B/T/326/2023(S)**

**B. Construction Engineering 3rd Year 2nd Semester Supplementary Examination 2023**

**PRE-CAST & PRE-STRESSED CONCRETE**

**PART II (50 Marks)**

Use **Separate Answer Script** for Each Part

Answer any **Two** Questions. Assume any suitable data not provided.
Answer should be explained with **Neat Sketches.**

1. (a) Discuss **Principle of Pre-stressed Concrete** from **Elastic** Concept with example **10**

   (b) **Design a pre-stressed concrete beam** of rectangular cross section over a simple supported span of 20 m. A super imposed load of 12 KN/m udl and a point load of 40 KN at mid span will be subjected on the beam. The **permissible stresses in concrete are 0 and 14 MPa** and **1400 MPa** in Pre-stressing steel. **15**

2. a) Discuss the **Principle** of **Pre-stressed Concrete** from **Load Balancing Concept** with example. **10**

   b) Define **Pressure Line from Lever Arm Concept** indicating significance of **Kern points and Kern distances** in pre-stressed concrete. **15**

3. An **I** beam is used to support live load of 30 KN/m over a simple supported span of 24 meters. The size of the flanges is 800 x 200 mm at top and 400 x 400 at bottom. The overall depth of the pre-stressed beam is 1250 mm. Thickness of the web is 150 mm. Assume density of concrete is 25 KN/m3. Initial pre-stressing forces each of 1400 KN applied through the two numbers of cable ducts, each of 75 mm diameters. The centres of these ducts are located at 200 mm above the soffit (bottom) of the beam at mid span. Calculate the stresses at transfer and final stages at top and bottom fibres at mid span. Assume total loss of pre-stress of 12.5 % at the final stage. **25**