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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program:B.Tech.(Civil Engineering) | **Semester – VI**
Subject (Course): Prestressed Concrete | **Max. Marks : 100**
Course Code :CEEG423 | **Duration : 3 Hrs**
No. of page/s:

Note: Attempt All Questions. Assume suitably any data not given and state clearly.

	Section A		
1.	**Loss of Prestress commonly occurs in Prestressing process. In which process loss is higher, pretensioning or post tensioning and why. Explain briefly.**	**[4]**	**CO1**
2.	**What is the role of shear connectors in precast beam and slab. Show in a figure how shear connectors are provided in precast beam and slab constructions.**	**[4]**	**CO2**
3.	**What is concordant profile. Sketch the concordant profile in a beam for the following cases:** **a. Simply supported beam subjected to udl throughout the span** **b. Simply supported beam subjected to point load at the midspan**	**[4]**	**CO3**
4.	**Explain through figure why is it useful to provide prestress in compression members.**	**[4]**	**CO4**
5.	**For prestressing large diameter water tanks, explain how buttresses are used for circular prestressing.**	**[4]**	**CO5**
	SECTION B		
6.	**A prestressed post tensioned concrete beam of rectangular cross section is to be made up from M40 concrete is simply supported over a span of 12 m and carries a live load of 14 KN/m run overfull span of the beam. The beam is erected on the supports immediately after prestressing and live load is applied much later. HT wires of 6mm diameter having UTS of 1800 MPa are available for prestressing.** **Design the beam assuming that wires are prestressed upto 80% of UTS initially and losses are 20%.**	**[10]**	**CO2**

7.	**(i) A post tensioned two span continuous beam in provided in a multistoried building having each span 15m long. The uniformly distributed load transferred on the beam from the floor slab is 18kN/m. Assuming 15% losses, suggest:** **a. A suitable cross section for the beam,** **b. A concordant cable profile for the beam.** **c. Suitable value of eccentricities of cable and initial prestressing force to be applied such that the live load is fully balanced.** **or** **(ii) A simply supported prestressed beam of span 10m and size 250x800m is designed to carry a live load of 20kN/m. The prestressing force is applied at an eccentricity of 200mm. Calculate the initial prestressing force to be applied such that 75% of live load is balanced. Also calculate the stresses in the extreme fibres of the beam at the application of this initial prestressing force, when the beam is still on ground.**	**[10]**	**CO3**
8.	**A prestressed column provided in a multistoreyed building is 5m long and has a cross section of 450x450mm . It is provided with concentric prestressing made up with four number HTS wires of 8mm diameter having UTS of 1200 MPa. The column carries an axial load of 400 KN. If the column goes out of plumb by 50mm, check if tensile stress develops in the column.**	**[10]**	**CO4**
9.	**Explain the external loads that can cause longitudinal stresses in water supply pipes and how can such stresses be taken care off. Explain the design approach followed by the IS code for design of such pipes.**	**[10]**	**CO5**
	SECTION C		
10.	**A prestressed backstay member is to be provided in a suspension bridge to carry a tensile force of 1200KN. Design the member using M40 concrete and HTS wires of 8mm diameter having UTS of 1400MPa. Assume maximum eccentricity as 50mm.**	**[20]**	**CO4**
11.	**(a) A clarifier tank of diameter 22m and wall thickness 100mm and depth 5m is used to store water in a water treatment plant. The tank has circular prestressing with 10 mm prestressing wires at 120 mm C/C having UTS of 1600 MPa and concrete grade M45 is used. Assume 20% losses. Check if the tank is safe when full with water upto full depth. Calculate up to what level can water be filled in the**	**[20]**	**CO5**

	tank safely. **Or** **(b) A flocculation tank of diameter 30m and wall thickness 100mm and depth 5.5m is used for treatment of water in a city water supply scheme. If 10 mm prestressing wires having UTS of 1800 MPa are available, design the tank using concrete grade M40 . Assume 20% losses. Sketch how prestressing wires can be provided in the tank at intervals of 1m height.**		

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Name of the College (Please tick, symbol is given)	:	**SOE**	☒	**SOB**		**SOL**	
Program	:	**B.Tech.(Civil Engineering)**					
Semester	:	**VI**					
Name of the Subject (Course)	:	**Prestressed Concrete**					
Course Code	:	**CEEG423**					
Name of Question Paper Setter	:	**Dr Vijay Raj**					
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Note: Please mention additional Stationery to be provided, during examination such as Table/Graph Sheet etc. else mention "NOT APPLICABLE":							

Note: - Pl. start your question paper from next page

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	Section A		
1.	**Explain through a diagram how the P line and C line can be drawn in Prestressed Concrete sections and what is its importance.**	**[4]**	**CO1**
2.	**Explain through a sketch how prestressing wires are provided in a prestressed slab.**	**[4]**	**CO2**
3.	**A crane is lifting a prestressed beam that is finally to be placed on simple supports at the site. If the beam is being lifted by a hook provided in the middle of beam, show in a figure where non prestressed reinforcement should be provided such that no cracks develop in the beam.**	**[4]**	**CO3**
4.	**A larger prestress can be provided in tension members as compared to compression members. Explain why.**	**[4]**	**CO4**
5.	**Sketch the P line and T line in circular prestressing and explain why eccentricity is taken as zero in circular prestressing.**	**[4]**	**CO5**
	Section B		
6.	**A post tensioned prestressed concrete beam of size 600x250mm is simply supported over a span of 12m. It is prestressed initially with a force of 1100kN at an eccentricity of 200 mm. The beam is initially cast on ground, prestressed and**	**[10]**	**CO2**

	lifted to place at site immediately. The live load is applied much later. Assuming 15% losses, Calculate: **1. Initial stresses in concrete at extreme fibres on placing the beam at site.** **2. Stresses after a live load of 16kN/m is applied on the beam full span.**		
7.	**(a) Design a prestressed post tensioned concrete beam of rectangular cross section made up from M30 concrete simply supported over a span of 15 m and carries a live load of 12 KN/m run overfull span of the beam. The beam is cast and prestressed at site and erected on the supports much later. HT wires of 8mm diameter having UTS of 1800 MPa are available for prestressing. Assume losses are 20%.** **Or** **(b) A simply supported prestressed beam of span 12m and size 250x700m is designed to carry a live load of 18kN/m. The prestressing force is applied at an eccentricity of 200mm. Calculate the initial prestressing force to be applied such that full live load is balanced. Also check if tension occurs at any stage .**	**[10]**	**CO3**
8.	**The cross section of a composite simply supported beam of 10 m span consists of a precast web of size 700x300mm having cast-in-situ RCC flange of size 1200x100mm. The initial pre-stress force of 1200kN is applied at a distance of 50mm from the soffit of beam. Calculate the stresses developed in the beam.** **a. When the web is prestressed at site** **b. Web is lifted immediately after prestressing** **c. Losses occur and slab is cast.**	**[10]**	**CO4**
9.	**A prestressed column is provided in a residential double storeyed building with a staircase. The column has a cross section of 350x350mm and is concentrically prestressed with four number HTS wires of 10mm diameter having UTS of 1800 MPa. The column carries an axial load of 150 KN from each storey and 60 KN from staircase. In addition it has a 2.5m projected balcony. The balcony can carry an all inclusive uniformly distributed load of 10KN/m. Determine the extreme stresses in the column cross section.**	**[10]**	**CO5**
	Section C		
10.	**(i) A prestressed tie member to support a retaining wall is made up of M40 concrete. The member has cross section of size 200x200mm and is concentrically prestressed by eight HTS wires of 8mm diameter having UTS of 900 MPa. The supporting earth is filled much later and exerts a tensile force of 350 KN axially on the tie. Assuming 20% losses, Check if the force can be carried safely by the tie member when:**	**[20]**	**CO4**

	a. **Acting axially,** b. **Acting at an eccentricity of 25mm.** **Or** **(ii) A prestressed tension member made up of M40 concrete is provided in a bridge truss . The member has cross section of size 150x150mm and is prestressed with four numbers of HTS 8mm diameter wires having UTS of 1200MPa. The member is required to carry a tensile force of 150 KN . Check if the force can be carried safely by the tie member when:** a. **Acting axially,** b. **Acting at an eccentricity of 10%.** **If the live load on the member is applied after a long time, check if the member is still safe. Assume losses as 15%.**		
11.	**A cogulation tank of diameter 25m and wall thickness 100mm and depth 5m is to be built for treatment of water in an industry.. If 12 mm prestressing wires having UTS of 2000 MPa are available, design the tank using concrete grade M40 . Assume 15% losses. Sketch the details of prestressing wires to be provided in the tank through out the height.**	**[20]**	**CO5**