Enroll No

K.E.Society's

Rajarambapu Institute of Technology, Rajaramnagar

(An Autonomous Institute, affiliated to SUK)

End Semester Examination (Summer 2019)

M.Tech. Civil Structural Engineering

Sem- II **Course Code:** CES2062

Course Name: P.E.-II Advanced Earthquake Engineering

Q.P.Code
EB 1494

Day & Date: Fri, 03/05/2019

Time: 10.30 am - 1-30 pm   Max Marks: 100

Instructions: 1) All questions are compulsory

2) Figures to the right indicate maximum marks

3) Assume suitable data if not given

4) Use of non-programmable calculator is allowed

Q.1				
	(a)	Explain IS provisions for improving performance of masonry structures under earthquake forces.	07	CO2
	(b)	Explain strategies in location of walls, size and shape of wall, failure mechanism of structural and non structural walls.	08	CO2
Q.2				
	(a)	Explain design steps of elevated circular or rectangular water tank as per IS 1893 provisions.	15	CO4
Q.3				
	(a)	Explain IS 13920 2016 provisions for shear wall for ductility.	08	CO2
	(b)	Explain with example ductility design of flexural member as per IS 18920 2016.	08	CO2
Q.4		Explain in detail with sketch any two		
	(a)	Base Isolation	07	CO5
	(b)	Dampers	07	CO5
	(c)	Behavior of RCC and pre-stressed beam element beam under Cyclic loading	07	CO3
Q.5				
	(a)	Explain different methods of computing transverse vibrations of a beam or shaft with several point loads.	10	CO3
	(b)	A uniform steel beam 2m long is simply supported at its ends and carries loads of 1000N at a distance of 500mm from each support. Calculate the lowest natural frequency for a system by any suitable method if the mass of beam itself neglected. Take I= 2×10^5 mm^4, E= 2×10^5 N/mm^2.	10	CO3
Q.6	(a)	Explain different vibration control techniques. Explain principle of control of vibration with the help of tuned mass dampers with sketch.	12	CO5
	(b)	Explain vibrations induced in the bridge structure due to traffic loads.	08	CO3

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Rajarambapu Institute of Technology, Rajaramnagar

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End Semester Examination (Summer 2019)

First Year M. Tech. Structural Engineering

Theory and Applications of Cement Composites (PE-II)

Course Code: CES 2072

Q. P. Code
EB 1495

Day & Date: Friday & 03-05-2019

Time: 10.30 am – 1.30 pm

Max Marks- 100

Instructions: *1) Figures to the right indicate full marks*
2) Assume suitable data if necessary
3) Use of non programmable calculator is allowed

Q.1				
	a)	With a neat sketch explain what is Laminated Composite material, its properties and examples.	**06**	**CO1**
	b)	Write mechanical properties of fiber reinforced concrete.	**05**	**CO2**
	c)	Differentiate between fiber reinforced concrete and normal reinforced concrete.	**05**	**CO2**
Q.2	**a)**	Derive stress strain relation for Plane stress in an orthotropic material	**10**	**CO3**
		OR		
	b)	Derive thermo mechanical stress strain relation of composite material	**10**	**CO3**
	c)	Explain maximum strain failure criteria	**06**	**CO3**
Q.3	**a)**	Write properties of synthetic fibers	**08**	**CO2**
	b)	Differentiate between prestressed concrete and ferrocrete	**08**	**CO2**
		OR		
	c)	With a neat sketch explain basic types of meshes used in ferrocement structures	**08**	**CO2**
Q.4	**a)**	Write the factors affecting on efficiency of SIFCON	**06**	**CO1**
	b)	Define polymer concrete. Write applications of polymer cement concrete	**06**	**CO1**
	c)	List advantages and disadvantages of composite materials	**06**	**CO1**
Q.5	**a)**	Explain in detail common types of damages met with ferrocement structures.	**06**	**CO1**

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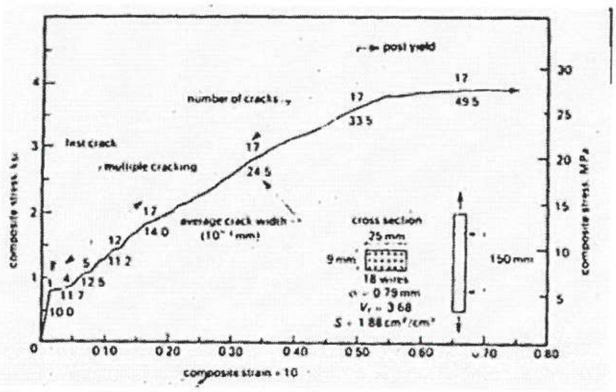
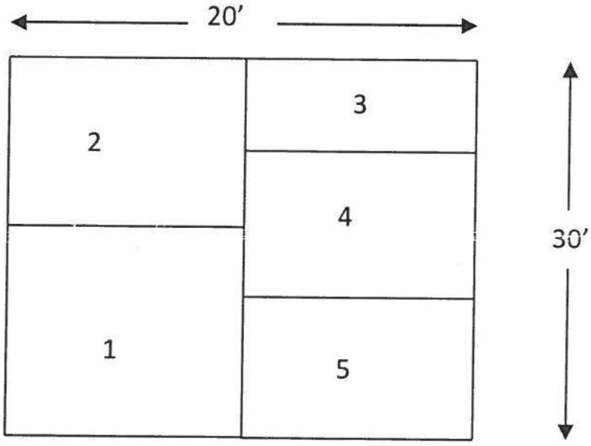
b) Stress-Strain curve of ferrocement in tension is as shown in figure. With reference to this comment on the behavior of ferrocement and work done. **12** **CO2**



Stress-Strain curve of ferrocement in tension

OR

c) Work out increase in carpet area of an building in brickwork with the external dimensions in feet units are given in fig. In this plan all the external 9 inches brick walls are replaced by 6 inches thick ferrocrete cavity wall and the internal walls of 6 inches thickness in brick are changed to 2 inches ferrocrete partition walls. **12** **CO4**



Q.6 **a)** Design a Ferrocement counterfort soil retaining wall for: Height of wall 4.00m,Spacing of counter forts 2.00m c/c, arch rise 0.5m for stem and heel, Base width0.4x4=1.6m,soil density 2000kg/cub m, Angle of repose 30 degrees, Cp=1/3. **16** **CO4**

OR

b) List the Design recommendations for designing a ferrocement structure by limit state or working stress method, made by ACI in their code of practice. **16** **CO4**

QP Code: EB 1566

Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute)
End Semester Examination
First Year M.Tech. Civil-Structural Engg SEMESTER- II
Program Elective – III

Design of Bridges and Flyovers CES 2092

Day & Date Tue., 07/05/2019
Time – 10.30 am – 1.30 pm

Max Marks- 100

Instructions

1. *All Questions are* ***compulsory****.*
2. *Figures to the* ***right*** *indicate* ***full*** *marks.*
3. ***Use*** *of IS 456:2000 & IRC Codes are* ***permitted***
4. *Use of non-programmable calculator is* ***allowed.***
5. *Assume any additional data* ***if required.***

Q 1 a	Explain 1 Economic span 2 Dispersion length and width	CO 1	08
b	Explain in detail various parameters in Pieguad's and Courbon's theory. In what circumstances it is applicable	CO 1	08
Q 2	Design vertical walls of box culvert using following data. Inside dimensions – 3.5 x 3.5 m Additional dead load – 15 KN/m^2 Density of RCC- 25 KN/m^3 Density of wearing coat- 22 KN/m^3 Thickness of wearing coat- 100 mm Unit weight of soil - 18 KN/m^3 Width of road- 7 m Angle of repose - 30^0 Loading- IRC Class AA- Tracked Vehicle Width of support (Bearing)- 400 mm No water load from inside Material- Concrete M- 40 & Steel Fe 415	CO 2	18
Q 3	Design top and bottom slab of a fly over bridge with following data Total width of road – 7.5 m Total span of one slab 4 m Density of RCC- 25 KN/m^3 Density of wearing coat- 22 KN/m^3 Thickness of wearing coat- 100 mm Loading- IRC Class AA- Wheeled vehicle	CO 2	18

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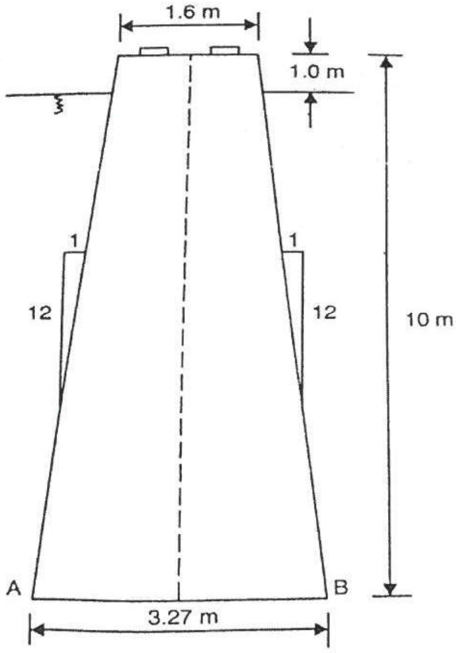
Q 3	Width of support (Bearing)- 400 mm Unit weight of soil - 18 KN/m^3 Angle of repose - 33^0 Material- Concrete M- 40 & Steel Fe 415 Use m1= 0.038, m2 = 0.031 for D.L. and m1= 0.08, m2 = 0.06 for L.L. Impact factor= 22% , Continuity factor = 0.8, Tc= 0.38 MPa OR Design the longitudinal girder using above data for the fly over bridge. Take thickness of deck slab as 400 mm	CO 2	18
Q 4 a	Compare the design analogy for Multi-span bridges and fly overs	CO 2	08
b	Explain step by step design procedure for designing concrete pier for a bridge. Show all sketches	CO 3	08
Q 5	Verify the stability of abutment from the following data Density of soil- 18 KN/m^2 Coefficient of friction – 0.6 Angle of repose of the soil - 30^0 IRC class 70 R loading Material M 25 and Fe 415 Total top width including bearing - 1.6 m Bearing – 1 m Thickness of deck – 400 mm Total height - 6 m Side slope- 1m horizontal in 5 m vertical Span of bridge- 15 m Deck consist of 3 longitudinal girders 0.6 x 1.5 m and deck slab of 400 mm Angle of friction between soil and concrete - 18^0 OR	CO 3	16
Q 5	Verify the adequacy of the dimensions of the concrete pier for the following data (Refer fig.) Top width of pier- 1.6 m Height of pier up to springing level – 10m C/C of bearing – 1000 mm side slope 1 in 12 (i.e. bottom width 3270mm) HFL 1000 mm below springing level Span of bridge – 16 m Reaction due to live load of one span – 700 KN Road :Two lane road with 1m wide footpath on either side D.L from Superstructure: (Consists of three longitudinal girders of 1.4 m depth with deck slab of 200 mm depth. Rib width of girders =	CO 3	16

	300mm.) = 1480.96 KN Material of pier: M 25, Fe 415. Max. mean velocity of current(v) – 3.0 m/sec Live load – IRC Class AA K' factor for semi circular section in plan – 0.66 Water pressure = $5.2Kv^2$  		
Q 6 a	Explain with sketch Joints in bridges	CO 3	04
b	Design a suitable bearing using following data. Justify answer. Vertical load (Sustained) – 225 kN Vertical Load (Dynamic) – 50 kN Horizontal force – 70 kN Modulus of rigidity of elastomer – 1 N/mm² Friction Coefficient – 0.33	CO 3	12

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End Semester Examination (Summer 2019)
M.Tech. Civil Structural Sem- II

Q.P.Code
EB1590

Course Code: CES2102 **Course Name**: PE III: Design of pre-stress Concrete Structures

Day & Date: Thu., 09/05/2019
Time : 10.30 am – 1.30 pm Max Marks: 100

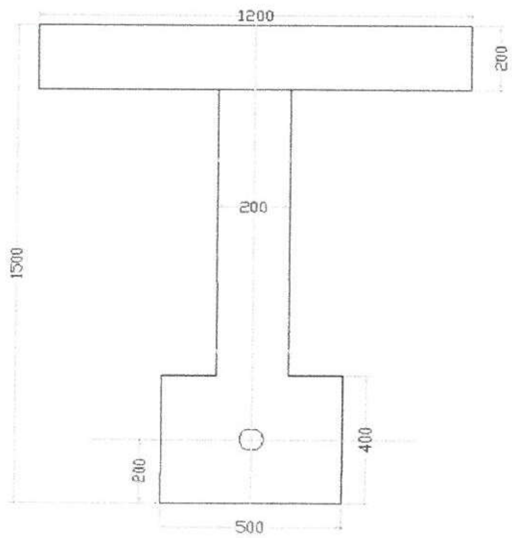
Instructions: 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.1

(a) Find extreme fibre stresses at midspan by the stress, strength and load balancing concept, in the simply supported prestressed beam of cross section 500mm wide and 800mm deep is loaded with uniformly distributed load of magnitude 9.6 kN/m on a span of 10 m and point load 150 kN at midspan of beam. Tendon profile is parabolic with a sag of 200mm at midspan and the tendon passing through the centroid of the section at ends. Prestressing force is 1200kN. 10 CO1

OR

A prestressed concrete bridge deck comprises unsymmetrical I section beams spanning over 20m. The cross section of a typical beam is shown in following figure. The beam is prestressed by seven Freyssinet cables, each carrying an effective force of 600kN located 200mm from the soffit at the center of span section. If the total maximum bending moment at the centre of span of the girder is 3600kNm, estimate the resultant stress developed at the section using the internal resisting couple method.



	(b)	Explain why high tensile steel and high grade concrete are used for pre-stressed concrete construction.	5	CO2
		OR		
		Explain the difference between the load carrying mechanism of reinforced and prestressed concrete beam sections with sketches.		
Q.2				
	(a)	A prestressing beam 200 mm wide and 300 mm deep is prestressed by 10 wires of 7mm diameter initially stressed to 1200 N/mm^2 with their centroids located 100 mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortning of concrete. If the concrete undergoes a further shortening due to creep and shrinkage while there is a relaxation of 5% of steel stress, estimate the final percentage loss of stress in the wires using the Indian standard code IS:1343 regulations and the following data: E_s=210kN/mm2 E_c= 5700 $(fcu)^{1/2}$ f_{cu}=42N/mm^2 Creep coefficient (Φ) =1.6 The residual shrinkage strain = 3 X 10^4	10	CO3
		OR		
	(b)	Enlist different losses in pre tensioning and post tensioning system of pre-stressing. Explain any two losses in detail.	5	CO3
Q.3				
	(a)	A pre-stressed concrete beam of uniform rectangular cross section and span 15 meters supports a total distributed load of 272 kN excluding the weight of the beam. Determine the suitable dimensions of the beam and calculate the area of tendons and their positions. The permissible stresses are 14 N/mm^2 for concrete and 1050 N/mm^2 for the tendons.	9	CO4
	(b)	Explain steps of designing pre-stressed concrete I-section beam.	6	CO4
Q.4		A post tensioned continuous beam consists of two spans each of 20 meters long. The external loading other than the dead load of the beam is 20 kN/m. Design the beam. Select I shape section of the beam.	15	CO4
Q.5				
	(a)	Design a prestressed concrete non cylindrical pipe of internal diameter of 500mm to carry water with a pressure of 1 N/mm^2. The concrete used has 14 N/mm^2 as permissible compressive stress at transfer. Steel wire of 3mm diameter is available and it can be stressed to a level of 1000 N/mm^2. The prestressing losses may be assumed to be 20% and a loss coefficient of 0.8 may be assumed. Barring other loads and their combinations, for water pressure load, the pipe concrete should have a residual compressive stress 0.7 N/mm^2 at service load conditions. Evaluate also the test pressure that the pipe can with	10	CO4

stand if concrete can be stressed to a level of 0.7N/mm^2 in tension. For prestressing steel E modulus may be assumed to be 250 kN/m^2 and that of concrete is 35 kN/m^2.

(b) Design a free edge water tank of diameter 36 meter to store water to a depth of 5 meter. 10 CO4

Assume ultimate stress in steel = 1500 N/mm^2.

Stress in steel at transfer = 70% of the ultimate stress.

Safe stress in concrete in compression at transfer = 0.5 f_{ck}.

Compressive stress in concrete at service condition = 0.1 f_{ck}.

Final stress in steel = 0.8 X Stress in steel at transfer.

Modular ratio = 5.5.

f_{ck} = 45 N/mm^2.

Q.6 Following fig. shows the cross section of a composite beam which consist of a 300mmX900mm precast stem and cast in situ flange 900mmX150mm. The stem is a post tensioned unit with an initial prestressing force of 2500 kN. The effective prestress available after making deduction for losses, is 2200 kN. The dead load moment at mid span due to the weight of the precast section is 250kNm. The dead load moment due to the weight of the flange is 125 kNm. After the hardening of the flange concrete, the composite section has to carry a live load which produce a bending moment of 700kNm. Determine the stress distribution in concrete at the various stages of the loading. 20 CO5

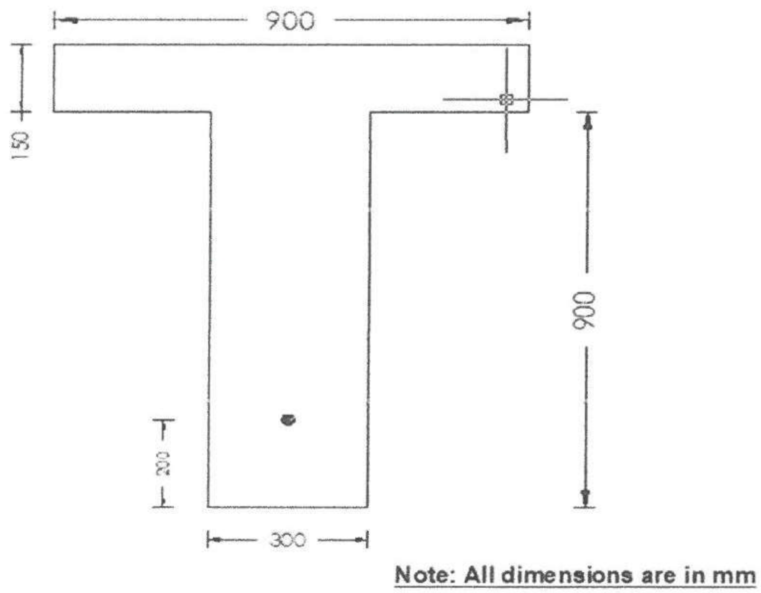


Fig. - 2

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EB 1620

End Semester Examination, 2019

First Year M. Tech. Structural Engineering, Semester II

Course: Design of Advanced Concrete Structures (PE-IV), Course Code: CES2122

Date & Day: 11-05-2019, Saturday

Time: 10.30 to 1.30

Maximum Marks: 100

Instructions: *1. All questions are compulsory.*
2. Use of non-programmable calculator is allowed.
3. Use of IS:456, IS:3370, IS:1641, IS:1642 is allowed
4. Use any additional data required and mention it clearly

1	**a**	Sketch the most probable yield line pattern for a uniformly loaded square slab of side ℓ i) supported on columns located at four corners ii) simply supported at three edges and one edge free iii) simply supported on two opposite edges.	**06**	**CO1**
	b	Design an isotropically reinforced rectangular slab 5.5m × 4.5m effective simply supported on all edges for residential building. The load factor for dead load and live load may be taken as 1.5. Assume Fe415 steel and M20 concrete. Use yield line theory for calculation of ultimate moment.	**10**	**CO2**
		OR		
	b	Design a continuous one way slab of span 4.5m for a residential building. It is equally reinforced at the center and over the supports. Use yield line theory for calculation of ultimate moment.	**10**	**CO2**
2	**a**	Explain how following factors influence fire resistance rating of reinforced concrete members: i) Type of concrete and Aggregate ii) Member size and detailing iii) Reinforcing steel and cover iv) Continuity and restraint	**08**	**CO1**
	b	Discuss the effect of fire on: i) simple beams and slabs ii) continuous beams and slabs iii) columns	**06**	**CO1**
3		A continuous beam has to be designed to carry a heavy load of 210kN/m over its entire span for a building. It is 4.5m deep, 300mm thick and the supports are columns 900mm in width. The center to center distance between supports is 9m. Design the deep beam. Use Fe415 steel and M20 concrete. Draw neat sketch showing detailing of the reinforcement. Use codal provisions as per IS:456:2000.	**15**	**CO2**

Q.		Question	Marks	CO
4		Design an interior square panel of size 6m×6m of flat slab for library building of an institute. Check the slab for shear. If slab is unsafe for shear, design of shear reinforcement is not expected. Sketch the detailing of reinforcement. Use direct design method as per IS456:2000.	**15**	**CO2**
		OR		
4		A reinforced concrete grid floor is to be designed to cover a floor area of size 12m × 20m. Assume suitable spacing between ribs. Live load on the floor is $2kN/m^2$. Design the grid beams of the floor.	**15**	**CO2**
5	a	A circular overhead water tank is to be designed for a colony. The capacity of the water tank required is $320m^3$ of water. Design a wall of this water tank assuming it is fixed at base and free at top. Use codal provisions as per IS: 3370. Assume suitable free board. Use appropriate grade of steel and concrete. Show detailing of the reinforcement in the wall.	**15**	**CO2**
	b	Design a bottom slab for water tank designed in ***Q.5(a)*** supported by bottom ring beam which in turn supported by eight columns. Assume slab is simply supported over the ring beam.	**05**	**CO2**
6	a	Distinguish between bunkers and silos.	**04**	**CO1**
	b	A reinforced concrete bunker is to be designed for storage of coal. The side of vertical wall of square bunker is 3m and height 3.5m. Hopper bottom is at 45 degrees to the horizontal and size of opening is 0.5m × 0.5m. The density of coal is $8kN/m^3$ and angle of repose is 25 degree. Design the side walls of the bunker. Draw the sketch showing reinforcement detailing in the side walls.	**16**	**CO2**