Modified

CBCS SCHEME

USN | | | | | | | | | | |

15CV72

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Design of RCC and Steel Structures

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any TWO full questions, choosing one full question from each module.***
2. ***Use of IS-456, IS-800 SP (6) and Steel tables are permitted.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 Design a slabtype rectangular combined footing for two columns of size 300mm × 450mm and 300mm × 600mm, subjected to axial loads of 650 kN and 900 kN respectively. The columns are spaced at 3.6 m c/c. The width of the footing is restricted to 1.8 m. Use M20 grade concrete and Fe415 grade steel. Assume SBC of soil = 160 kN/m^2. **(40 Marks)**

OR

2 Design a Cantilever retaining wall to retain an earth embankment with a horizontal top 3.50 m above ground level. The unit weight of back fill is 18 kN/m^3. Angle of internal friction $\phi = 30^\circ$. SBC of soil = 180 kN/m^2. Take coefficient of friction between soil and concrete = 0.55. Adopt M20 grade concrete and Fe415 grade steel.
Depth of foundation = 1.0 m. **(40 Marks)**

Module-2

3 Design a roof truss shown in Fig. Q3 with forces in each member of the truss are given in table Q3. The size of RC column supporting the truss is 300mm × 300mm. Use M20 grade concrete for column. Design the truss using bolt of M16, property class 4.6 for connections and also design anchor bolts. **(40 Marks)**

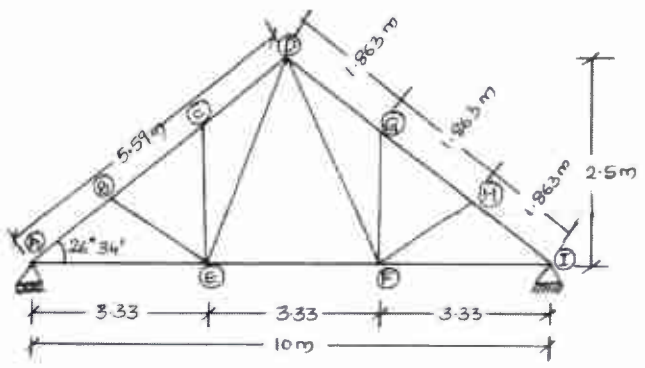

Fig. Q3

Member	Design force in kN	
	Compression	Tension
Top chord member	54.25	-
Bottom chord member	-	48.31
Diagonal member (DF, DE)	14.35	-
Member BE, HF	-	24.50
Member CE, GF	12.40	-

OR

4 Design a simply supported crane gantry girder for the following data: The crane is electrically operated. Yield stress of steel is 250 N/mm^2.

(i) Span of Crane girder = 20 m
(ii) Effective span of gantry girder = 7.4 m
(iii) Capacity of crane = 220 kN.
(iv) Self weight of Crane girder excluding crab = 200 kN.
(v) Weight of Crab = 60 kN.
(vi) Wheel base distance = 3.4 m
(vii) Minimum hook approach = 1.2 m.
(viii) Self weight of rail = 300 N/m
(ix) Height of rail = 75 mm

Gantry girder is to be supported on RCC column bracket of size $300mm \times 450mm$. Size of column $300mm \times 600mm$. **(40 Marks)**

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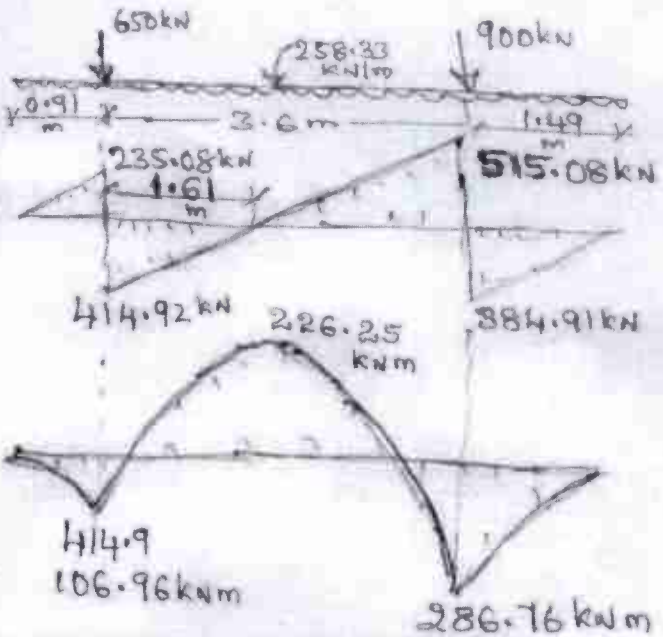
Scheme & Solution Signature of Scrutinizer

Subject Title: Design of RCC & Steel Struduses **Subject Code:** 15CV72

Question Number	Solution	Marks Allocated
Q1	Module-1 Column A - 300mm x 450mm - $P_1 = 650$ kN Column B - 300mm x 600mm - $P_2 = 900$ kN Total load = 1550 kN Area of footing $= \frac{1.1 \times 1550}{160} = 10.66\ m^2$ B = 1.8m (given) $L_{reqd} = \frac{10.66}{1.8} = 5.92m \simeq 6m$ Distance of point of application of resultant from column A $= \frac{900 \times 3.6 + 0}{1550}$ $\bar{x} = 2.09$ m. Extension of footing beyond column A (c/c) = 0.91m Extension of footing beyond centre of col. B = 1.49 Soil pressure on footing $= \frac{1550}{6 \times 1.8} = 143.52\ kN/m^2$ Udl $\omega = 143.52 \times 1.8 = 258.33$ kN/m  	7 marks 3 marks 3 marks

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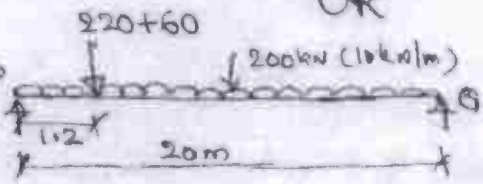
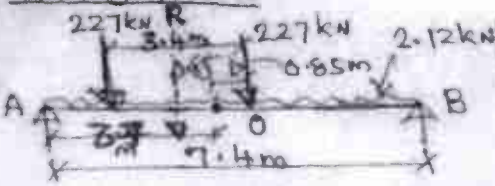
BELAGAVI - 590018

Subject Title: Subject Code:

Question Number	Solution	Marks Allocated
	Depth required for max. Bm or Depth required for max. one way Shear Assuming percentage of tension steel. and check for one way shear	8 marks
	Ast for Maximum +ve B m Ast for B M under Col. A. Ast for Bm under Col. B. Minimum Ast required.	8 marks
	Check for two way Shear under Col. A and Col. B – 2 x 3	6 marks
	Ast for transeverse bending –	2 marks
	Sketches – Longitudinal Section. –	3 marks
		40 marks
	OR	
Q 2.	Design of retaining wall.	
	Total height of retaing wall = 3.5 + 1 = 4.5 m Proportioning of different parts of ret. wall Dimension of baseslab, Toeslab, heel slab Thickness of stem & base slab	6 marks
	Check for Stability of retaiwingwall	8 marks
	Check for Soil pressure at toe & heel	6 marks
	Design of Stem –	8 marks
	Design of heel slab –	6 Marks
	Design of toe Slab –	6 marks
	with Sketches (dgs)	40 marks

Subject Title: Subject Code:

Question Number	Solution	Marks Allocated
	Module - 2	
Q 3.	Design of Top chord members - & Joints	6 marks
	Design of bottom chord Member - & Joints	8 marks
	Design of discontinuous (inner) members Subjected to tensile force ------	8 marks
	Subjected to Compression ------ (Including design of Joints)	8 marks
	Design of Supporting Section -	
	Design of baseplate/bearingplate	5 marks
	Design of Anchor bolt ---	5 marks
		40 marks
	OR	
Q 4.	 $R_P = \frac{280\times18.8}{20} + \frac{200}{2}$ $R_P = 363.2\,kN$	
	Each wheel load $= \frac{363.2}{2} = 181.6\,kN$	
	+ impact load 25% $= 45.4\,kN$	
	Total Wheel load $= 227\,kN$	3 marks
	Self weight $= \frac{227}{125} = 1.82\,kN/m$	
	Weight of rail $= 0.30\,kN/m$	
	Total udl $= 2.12\,kN/m$	1 mark
	Gantry Girder.  $R_B = \frac{227\times2\times(3.7+0.85)}{7.4} + \frac{2.12\times7.4}{2}$ $R_B = 182.7\,kN$	
	Maximum Moment at O, $M_O = 182.7\times2.85 - 2.12\times\frac{2.85^2}{2}$	
	$M_O = 512.085\,kNm$	4 marks

Subject Title: **Subject Code:**

Question Number	Solution	Marks Allocated
	$F_H = \frac{10}{100} \times 280 = 28\,kN$ $W_H = \frac{28}{2} = 14\,kN$	
	$M_y = \frac{520.695}{227} \times 14 = 32.11\,kNm$	2 marks
	$SF(Max) = 227 + \frac{227}{7.4} \times 4 + \frac{2.12 \times 7.4}{2} = 357.59\,kN$	
	$M_{z,4} = 768.13\,kNm$ $M_{y,4} = 48.165\,kNm$	
	$V_u = 536.33\,kN$.	2 marks
	Selection of Section, Calculation of $\bar{y}$, I_{xx}, I_{yy}, Z_e etc. ----	3 marks
	Calculation of EAA, Z_{pz}, Z_{py} ------	5 marks
	Calculation of M_{dz}, M_{dy} & Check for stresses.	3 marks
	Check for buckling resistance,	5 marks
	Check for Shear force	2 marks
	Check for Longitudinal Stress.	2 marks
	Check for deflection.	3 marks
	Design of Connections -	3 marks
	Neat Sketch of C/S at Support ----	2 Marks
	* * * * *	40 marks

Approved

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