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emptying are 0.5 and 0.7 respectively. Angle of internal friction is 25° . Angle of wall friction for filling and emptying is 25° . The width is 10 m and height for vertical portion and hopper portion is 5 m.

- OR iii. Design only cylindrical part of a Silo having internal diameter 5 m and height 12 m to store cement. Take bulk density of cement as 1550 kg/m^3 and angle of internal friction as 25° . Take $\lambda_e = 0.7$ and $\lambda_f = 0.5$. 8

Total No. of Questions: 6

Total No. of Printed Pages: 4

Enrolment No.....



Faculty of Engineering
End Sem (Odd) Examination Dec-2019
CE3ES03 Advanced Design of Steel Structures

Programme: B.Tech.

Branch/Specialisation: CE

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. A plate girder is used when 1
(a) Span is large and loads are heavy
(b) Span is small and loads are heavy
(c) Span is small and loads are light
(d) Span is large and loads are light
- ii. The modes of failure of plate girder are 1
(a) By yielding of compression flange only
(b) By buckling of tension flange only
(c) By yielding of tension flange and buckling of compression flange
(d) By yielding of compression flange and buckling of tension flange
- iii. Why plate girder is preferred over truss girder? 1
(a) Plate girder requires costly maintenance
(b) Higher vertical clearance required for plate girder than truss girder
(c) Cost of fabrication of plate girder is high
(d) Cost of fabrication of truss girder is high
- iv. Which of the following is true for economic spacing? 1
(a) Cost of trusses should be equal to twice the cost of purlins
(b) Cost of trusses should be equal to twice the cost of purlins minus cost of roof coverings
(c) Cost of trusses should be equal to the cost of purlins plus cost of roof coverings
(d) Cost of trusses should be equal to twice the cost of purlins plus cost of roof coverings

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- v. Which of the following load combination is not considered for design of roof trusses? **1**
 (a) Dead load + crane load
 (b) Dead load + wind load
 (c) Dead load + earthquake load
 (d) Dead load + live load + wind load
- vi. Live load for roof truss should not be less than **1**
 (a) 0.4kN/m^2 (b) 0.2kN/m^2 (c) 0.75kN/m^2 (d) 0.8kN/m^2
- vii. The lining in chimney is provided to resist **1**
 (a) Fire (b) Temperature
 (c) Smoke (d) All of these
- viii. Breech Opening is also known as **1**
 (a) Flue opening (b) Flow opening
 (c) Fly opening (d) None of these
- ix. Which of the following statement is TRUE? **1**
 (a) Bunkers are tall structures.
 (b) Plan of rupture meets the opposite side of the structure in Silo
 (c) Plane of rupture meets the top horizontal surface in Silo
 (d) The total load of material is supported by the floor of the Silo.
- x. The main assumptions of Janssen's theory are the following **1**
 (a) The material is uniform in texture.
 (b) The material has a definite angle of repose.
 (c) The co-efficient of friction between material and side wall is constant.
 (d) All of these
- Q.2 i. What are the components of deck type plate girder bridge of railways? **2**
 ii. What are the IRC recommendations for the design of plate girder bridges? **8**
- OR iii. Design only the central section of deck type plate girder bridge for single track B.G. main line loading for the following data: **8**
 Effective span: 24 m
 Spacing of plate girders: 1.9 m c/c
 Weight of stock rails: 440 N/m
 Weight of guard rails: 260 N/m
 Weight of fastening etc.: 280 N/m of track

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- Timber sleepers: 250mm x 150 mm x 2.8 m @ 0.4 m c/c
 Density of timber: 7.4 kN/m^3
 Take permissible stresses as per Railway Steel Bridge Code.
- Q.3 i. Write a short note on the arrangement of components of truss girder bridge. **2**
 ii. A truss bridge is to be designed for a two lane highway. Span of bridge is 40 m. Design cross girder, top chord member and diagonal member for this bridge and consider IRC class AA tracked loading. **8**
- OR iii. What are the effects of wind loads on truss girder bridges? Explain in detail. **8**
- Q.4 i. What are the advantages of Tubular trusses? **2**
 ii. Design an I-section purlin for the following data: **8**
 Spacing of roof trusses: 4 m
 Spacing of purlins: 1.9 m
 Pitch of roof: 1/ 4.5
 Weight of G.I. sheeting: 133 N/m^2
 Wind load intensity normal to roof: 1500 N/m^2
- OR iii. Write down step by step procedure to analyse roof truss in detail. **8**
- Q.5 i. What are the types of Chimney? **2**
 ii. Calculate Maximum overturning moment of a self-supporting steel stack for Ahmadabad city. The height of stack is 50 m above the foundation. The diameter of the cylindrical part of the chimney is 2.5 m. The thickness of fire brick work lining is 110 mm. **8**
- OR iii. Design the shell of a self-supporting steel stack for Nagpur city. The height of stack is 50 m above the foundation. The diameter of the cylindrical part of the chimney is 2.5 m. The thickness of fire brick work lining is 115 mm. The topography at the site is almost flat and location is of terrain category 2. **8**
- Q.6 i. Enlist the purposes of a tower or mast. **2**
 ii. Design vertical plate, hopper plate and horizontal beams of a bunker with 4 supporting columns to store pulverized compacted coal powder of bulk density 8.9 kN/m^3 . The pressure ratios for filing and

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Marking Scheme

Advanced Design of Steel Structures

Q.1	i.	A plate girder is used when (a) Span is large and loads are heavy	1		Design top chord	1 mark	
	ii.	The modes of failure of plate girder are (c) By yielding of tension flange and buckling of compression flange	1	OR	iii.	Effects of wind loads on truss girder bridges 1 mark for each effect	8 (1 mark * 8)
	iii.	Why plate girder is preferred over truss girder? (d) Cost of fabrication of truss girder is high	1	Q.4	i.	Any four advantages of Tubular trusses 0.5 mark for each	2 (0.5 mark * 4)
	iv.	Which of the following is true for economic spacing? (d) Cost of trusses should be equal to twice the cost of purlins plus cost of roof coverings	1		ii.	Calculation of Load and moment Calculation of section modules Class of section Flexural capacity check Check for deflection	8 3 marks 1 mark 1 mark 2 marks 1 mark
	v.	Which of the following load combination is not considered for design of roof trusses? (c) Dead load + earthquake load	1	OR	iii.	Step by step procedure to analyse roof truss 1 mark for each step	8 (1 mark * 8)
	vi.	Live load for roof truss should not be less than (a) 0.4kN/m^2	1	Q.5	i.	Types of Chimney 1 mark for each type	2 (1 mark * 2)
	vii.	The lining in chimney is provided to resist (b) Temperature	1		ii.	Section calculation Wind load calculation Overturning moment	8 2 marks 3 marks 3 marks
	viii.	Breech Opening is also known as (a) Flue opening	1	OR	iii.	Section calculation Wind load calculation Self weight of plates and lining Thickness of plate of section	8 1 mark 2 marks 1 mark 4 marks
	ix.	Which of the following statement is TRUE? (b) Plan of rupture meets the opposite side of the structure in Silo	1				
	x.	The main assumptions of Janssen's theory are the following (d) All of these	1				
Q.2	i.	Components of deck type plate girder bridge of railways	2				
	ii.	IRC recommendations for the design of plate girder bridges 1 mark for each recommendation	8 (1 mark * 8)	Q.6	i.	Purposes of a tower or mast. 1 mark for each purpose	2 (1 mark * 2)
OR	iii.	Load calculation Bending moment Shear force Depth Flange area Check for stress	8 3 marks 1 mark 1 mark 1 mark 1 mark		ii.	Calculation of force Design of wall Design of horizontal beam Design of hopper bottom	8 2 marks 3 marks 2 marks 1 mark
					iii.	Calculation of pressure Design of wall	8 4 marks 4 marks
Q.3	i.	Arrangement of components of truss girder bridge	2				*****