Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2180610 **Date: 29/11/2018**

Subject Name: Design of Steel Structures

Time: 02:30 PM TO 05:30 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of IS 800:2007,IS:875 and Steel table is permitted.**

Q.1	**(a)**	Define Shape Factor, Collapse load and Plastic Hinge.	**03**
	(b)	Explain various components of an industrial building with suitable sketches.	**04**
	(c)	Calculate nodal loads (per panel point load) for the howe roof truss due to dead load, live load and wind load for an industrial building of size 18 m x 40 m situated in Surat with terrain category-3 and class-B . Spacing between two trusses = 4 m c/c. Rise of truss = 4 m. Consider 10% wall openings. The truss has total 10 segments. Corrugated GI Sheets are used as roofing material. Height of eaves level is 12 m. Assume suitable data if necessary.	**07**
Q.2	**(a)**	Enlist the elements of welded plate girder with sketch.	**03**
	(b)	Explain simple post critical method to evaluate shear strength of web of plate girder as per IS 800:2007	**04**
	(c)	A portal frame consists of two hinge supported column of 4 m height separated by a beam of span 5 m and loaded up to collapse with downward uniformly distributed load of 15 kN/m and lateral point load of 50 kN at left beam column junction . Find the plastic moment of resistance if it is of uniform strength.	**07**
		OR	
	(c)	Design a suitable bolted connection of a ISHB 200@ 392.4 N/m section attached to the flange of a ISHB 300 at 577 N/m to carry a vertical factored load of 550 kN at an eccentricity of 250 mm. Use M24 bolts of grade 4.6	**07**
Q.3	**(a)**	Enlist advantages and disadvantages of steel structures.	**03**
	(b)	Explain in brief various types of loads to be considered in the design of steel structure.	**04**
	(c)	Design a suitable section for a two span continuous beam, each having a span of 6.0 m and supporting a dead load of 20 kN/m and live load of 25 kN/m by plastic design approach.	**07**
		OR	
Q.3	**(a)**	Distinguish between elastic modulus and plastic modulus.	**03**
	(b)	Derive the collapse load for fixed beam of length L, subjected to concentrated load W at center.	**04**
	(c)	Design a unstiffened seat connection for a factored beam end reaction of 220 kN. The beam section is ISMB 250 connected to the flange of column section ISHB 200 using bolted connections. Steel is of grade Fe 410 and bolts of grade 4.6.	**07**

Q.4	**(a)**	Design a hand operated travelling crane simply supported by gantry girder for the given data : Span of gantry girder = 5m, Span of crane girder = 15 m, Crane capacity = 200 kN, Self weight of crane girder excluding trolley = 200 kN, Self weight of trolley = 30 kN, Minimum hook approach = 1 m, Distance between wheels = 3.5 m c/c, Self weight of rails = 0.3 kN/m. Checks for buckling and deflections are not required.	**14**

OR

Q.4		Design a purlin and rafter of roof truss for an industrial building with 25 m span and 120 m length. The roofing is galvanized iron sheeting the basic wind speed is 50 m /s and terrain is open industrial area and building is class A. The clear height of building at the eaves level is 9 m.	**14**
Q.5		Design a foot bridge for the particulars: (a) cross beams (b) most heavily loaded bottom chord member (c) Top member in which maximum tension occur. Type of girder = N type of 20 m span and width of deck as 3.5 m. Consider dead load of 5 kN/m^2, LL of 4 kN/m^2 and floor finish of 1 kN/m^2. Consider total 08 panels.	**14**

OR

Q.5		Design a welded plate girder with vertical intermediate stiffeners using simple post critical method for span of 18 m. The girder is laterally restrained throughout and carrying uniformly distributed factored load of 120 kN/m (including self weight) over the entire span. Connections design and design of end bearing stiffener are not required.	**14**

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