Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2180610 Date: 07/05/2018

Subject Name: Design of Steel Structures

Time: 10:30 AM to 01:30 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, IS: 875 and Steel Tables is permitted.**
5. **Consider fy = 250 N/mm^2 and fu = 410 N/mm^2 if not mention**

Q.1	**(a)**	**Fill in the blank** (i) If the diameter of bolt is 20 mm then the maximum number of bolts that can be accommodated in one raw in a 200 mm wide flat are = _____ (ii) For welding, the partial safety factor for site welding is =_____ and for shop welding = _____. (iii) The shape factor for a solid circular section subjected to bending about its diameter is = _____	**03**
	(b)	Explain in brief various types of loads to be considered in the design of steel structure.	**04**
	(c)	What is tension field action in plate girder? What is diagonal tension field theory? How does pure tension field concept differ from incomplete tension field in plate girders?	**07**
Q.2	**(a)**	What you understand by class 4.6 and class 8.8 bolts? Explain briefly	**03**
	(b)	Determine the shape factor for an I-section consists of 8 mm thick web and 12 mm thick flanges. The depth of web excluding flanges is 300mm. the width of flanges is 120 mm.	**04**
	(c)	Design a suitable bolted connection of a ISHT-75 section attached to the flange of a ISHB 300 at 577 N/m to carry a vertical factored load of 600 kN at an eccentricity of 300 mm. Use M24 bolts of grade 4.6	**07**
		OR	
	(c)	Design a connection to joint two plates of 200 x 10 mm of grade Fe 410 to mobilize full plate tensile strength using shop fillet welds, if (i) a lap joint is used, (ii) a double cover butt joint is used	**07**
Q.3	**(a)**	Define: Rivet line, butt joint, Purlins.	**03**
	(b)	Explain the following connections with neat sketches: beam to beam web angle connection, beam to column flange seat angle connection	**04**
	(c)	Determine plastic moment capacity for given frame as shown in **fig-1**	**07**
		OR	
Q.3	**(a)**	Enlist advantages and disadvantages of steel structures.	**03**
	(b)	Explain the failure of a riveted joint with suitable examples.	**04**
	(c)	Determine plastic moment capacity of beam as shown in **fig-2** if load shown is working loads. Take load factor as 1.5	**07**
Q.4	**(a)**	Design a 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**

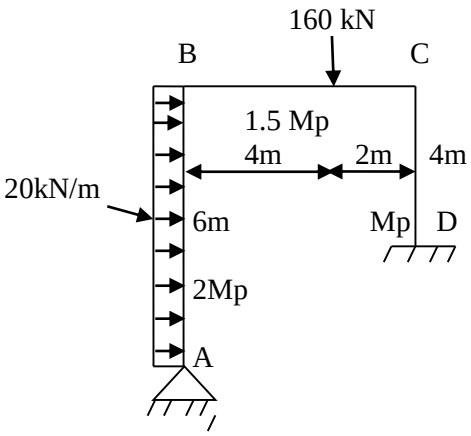
OR

Q.4 **(a)** Design a gantry girder to be used in an industrial building carrying a manually operated overhead travelling crane, for the following data: Crane capacity = 225 kN, self weight of the crane girder excluding trolley = 225 kN, Self weight of trolley, electric motor, hook, etc = 50kN, Approximate minimum approach of the crane hook to the gantry girder = 1.25m, wheel base = 3.5m, c/c distance between gantry rails = 16 m, c/c distance between column = 8 m, self weight of rail section = 300 N/m, Diameter of crane wheels =150 mm, Steel is of grade Fe 410. Design also the field welded connection if required. The support bracket connection need not be designed. **14**

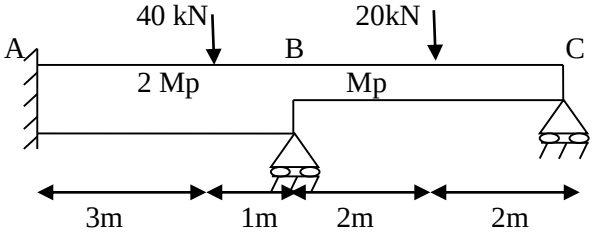
Q.5 **(a)** A foot over bridge has a span of 30m and width 3.7m. It carries a pedestrian load of intensity 4.5kN/m^2. Using a suitable truss geometry find the force carried by the end segment and the segment near centre of top chord member. Design that near centre. Design a typical cross girder. **14**

OR

Q.5 **(a)** Design a welded plate girder 24 m in span and laterally restrained throughout. It has no support a uniform load of 100 kN/m throughout the span exclusive of self weight. Design the girder with intermediate transverse stiffeners. The steel for the flange and web plates is of grade Fe 410. Design the cross section, the end load bearing stiffener and connections **14**



Q-3-C- Fig-1



Q-3-C (OR)- Fig-2