BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER :V**
BRANCH: PIE **SESSION : MO/2023**

SUBJECT: PE328 DESIGN OF MACHINE ELEMENT

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Discuss the various types of stresses and loads induced in the machine member?	[5]	1	2
Q.1(b)	Calculate the force required to punch a circular blank of 60 mm diameter in a plate of 5 mm thick. The ultimate shear stress of the plate is 350 N/mm^2.	[5]	1	2
Q.2(a)	Design a knuckle joint to transmit 20KN. The design stresses may be taken as 100 MPa in tension, 80MPa in shear and 150 MPa in crushing?	[5]	2	3
Q.2(b)	A 200 * 100* 10 mm angle is to be welded to a steel plate by fillet welds. If the angle is subjected to a static load of 100 KN, find the length of the weld at the top and bottom. If the allowable shear stress for static loading may be taken as 60 MPa?	[5]	2	3
Q.3	Two plates of 10 mm thickness each are to be joined by means of a single riveted double strap butt joint. Determine the rivet diameter, rivet pitch, strap thickness and efficiency of the joint. Take the working stresses in tension and shearing as 80 MPa and 60 MPa respectively.	[10]	3	4
Q.4(a)	A solid circular shaft is subjected to a bending moment of 1500 N-m and a torque of 5000 N-m. The shaft is made of 45 C 8 steel having ultimate tensile stress of 700 MPa and a ultimate shear stress of 500 MPa. Assuming a factor of safety as 5, determine the diameter of the shaft.	[5]	4	3
Q.4(b)	Design for Shaft and sleeve of a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 rpm. The material for the shafts is plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80 MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15 MPa.	[5]	4	3
Q.5(a)	Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures?	[5]	5	2
Q.5(b)	Explain the following terms of the spring: (i) Pitch; (ii) Solid height; (iii) Spring rate; (iv) Spring index; and (vi) Stress factor	[5]	5	2

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