DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular/Supplementary Winter Examination – 2024

Course: B.Tech **Branch : Mechanical Engg/Mechanical Engg(Sand wish) And Allied**

Subject Code & Name: BTMC502 Machine Design-I **Semester : V**

Max Marks: 60 **Date:08 /02/2025** **Duration: 3 Hr.**

Instructions to the Students:

1. *Each question carries 12 marks.*
2. *Question No. 1 will be compulsory and include objective-type questions.*
3. *Candidates are required to **attempt any four questions from Question No. 2 to Question No. 6.***
4. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
5. *Use of non-programmable scientific calculators is allowed.*
6. *Assume suitable data wherever necessary and mention it clearly.*

					(Level/ CO)	Marks
Q. 1	**Objective type questions. (Compulsory Question)**					**12**
1	**Which of the following is not a traditional design method**				**CO1**	**1**
	a. Reverse Engineering	**b. Brainstorming**	**c. Trial and error**	**d. Rapid prototyping**		
2	**Poor ergonomic design may lead to**				**CO1**	**1**
	a. Attractive design	**b. User discomfort**	**c. User satisfaction**	**d. Weak design**		
3	**Cotter joints are commonly used for**				**CO2**	**1**
	a. Connecting rods under axial loading	**b. Rotating shaft**	**c. Gears**	**d. Coupling**		
4	**Factor of safety in static loading condition is calculated as**				**CO4**	**1**
	a. Maximum stress by permissible stress	**b. Permissible stress by maximum stress**	**c. stress by strain**	**d. Strain by stress**		
5	**The stresses induced in the cotter of the cotter joint are**				**CO3**	**1**
	a. Tensile stresses	**b. Crushing stresses**	**c. Shear and bending stress**	**d. Torsional stresses**		
6	**Torsional rigidity of a shaft refers to its ability of**					**1**

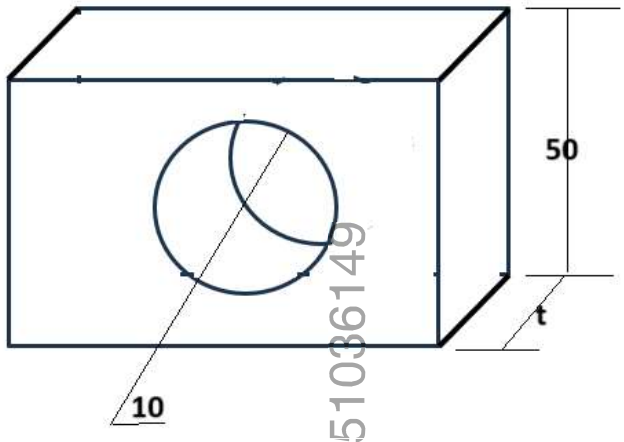
	a. Resisting bending forces	b. Resisting compressive forces	c. Resisting twisting moments	d. Resisting tensile forces		
7	The key fits in the keyway of the				CO6	1
	a. Shaft only	b. Hub only	c. Both shaft and hub	d. None of the above		
8	Use of multiple notches in a V shaped flat plate will				CO5	1
	a. Reduce the stress concentration	b. Increase the stress concentration	c. No effect on stress concentration	d. None of the above		
9	Which of the following line is the safest in machine design?				CO5	1
	a. Goodman line	b. Soderberg line	c. Gerber parabola	d. Lagrange line		
10	If a spring has plain ends then number of inactive coils is?					1
	a. 1	b. 2	c. 3	d. 0		
11	Maximum efficiency of a square threaded is given by				CO6	1
	a. 1-sinø / 1+sinø	b. 1+sinø / 1-sinø	c. 2-sinø / 1+sinø	d. 1-sinø / 2+sinø		
12	What is the minimum specified length of fillet weld?				CO6	1
	a. Two times the size of weld	b. Four times the size of weld	c. Six times the size of weld	d. Half the size of weld		

Q. 2	Solve the following.		12
A)	Explain the importance of standardization with suitable examples	CO1	6
B)	Write general design procedure to design a machine element	CO1	6
Q.3	Solve the following.		12
A)	A Knuckle joint is used to connect two rods which are required to withstand a tensile force of 100KN. The rods and pin are made of plain carbon steel 30C8 (S_{yt}= 400 N/mm^2) and the factor of safety is 5. Assume – Thickness of fork end = 0.75 times dia. of rod & Thickness of single eye end = 1.25 times dia. of rod. Calculate: 1. Diameter of rods	CO4	6

2.diameter of pin considering shear & bending failure.

B)	Write design procedure to design a socket and spigot cotter joint	CO3	6

Q. 4	Solve Any Two of the following.		12
A)	What are various causes of stress concentration? Discuss the different methods of reducing the effect of stress concentration	CO5	6
B)	A plate made of steel 20C8 (S_{ut}=440 N/mm^2) is hot rolled & normalized condition is shown in figure. It is subjected to completely reversed load of 30KN. The notch sensitivity factor 'q' is 0.8 and expected reliability is 90%. The factor of safety is 2. The size factor is taken as 0.85. The surface finish factor is 0.67. Determine the thickness of the plate.	CO5	6



C)	A rotating beam of specimen made of steel 45C8 (S_{ut}=630 N/mm^2) is subjected to a completely reversed bending stress. Calculate the endurance strength of the specimen for a life of 90000 cycles.	CO5	6

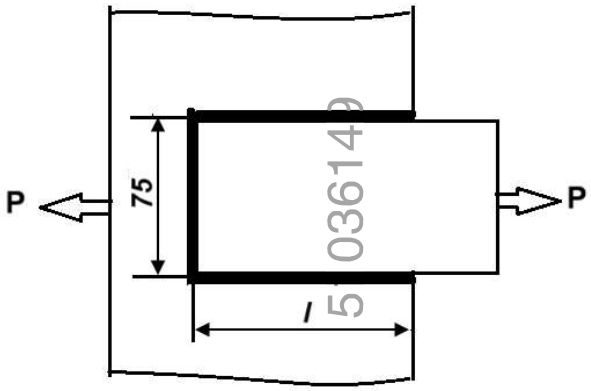
Q.5	Solve Any Two of the following.		12
A)	Explain the ASME code in design of shaft.	CO6	6
B)	With neat sketch explain different types of keys used in engineering	CO6	6
C)	Design a muff or sleeve coupling to connect two steel shafts transmitting 25 KW power at 360 rpm. The shaft and keys are made of plain carbon steel 30C8 (S_{yt}=S_{yc}=400 N/mm^2). The muff or sleeve is made of grey cast iron FG200 (S_{ut}=200 N/mm^2). The factor of safety for the shaft and key is 4. For muff or sleeve the factor of safety is 6 based on ultimate strength.	CO6	6

Q. 6 Solve Any Two of the following. **12**

A) A compression helical spring is to be designed for an operating load range of 90 to 135 N, deflection of the spring for this load range is 7.5mm, assume a spring index of 10, permissible shear stress of 480 MPa and modulus of rigidity of 80 KN/mm^2. Design the spring considering the Wahl stress concentration factor. **6**

B) Explain the Forms of threads used for power screw with its specific applications **6**

C) A plate 75 mm wide and 10 mm thick is joined by means of single transverse and double fillet welds as shown in figure. The joint is subjected to maximum tensile load of 55KN. The permissible tensile and shear stress in the weld material are 70 and 50 N/mm^2 respectively. Determine the required length of each parallel fillet weld **6**



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