KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Agrl. Engg.) 2018 Admission
III Semester Final Examination-December-2019

Fpme.2104 **Machine Design (2+0)** **Marks: 50**
Time: 2 hours

I **Match the Following** **(10x1=10)**

1.	_____ is the ability of the material to absorb energy before the fracture takes place.	a	infinite
2.	_____ life of a machine member is generally taken as 10^6 cycles.	b	shear
3.	The most suitable theory of failure for brittle material is maximum _____ theory.	c	crushing
4.	Slow and progressive deformation of material with time under constant stress is known as _____.	d	toughness
5.	A parallel fillet welded joint is designed for _____ strength.	e	thrust
6.	Cotter in a cotter joint is subjected to shear, _____ and crushing stress.	f	normal stress
7.	Key of muff coupling is subjected to shear and _____ stresses.	g	module
8.	_____ is the ratio of mean coil diameter to wire diameter.	h	creep
9.	_____ is the ratio of pitch circle diameter to the number of teeth.	i	bending
10.	Bearings used to support the load that acts parallel to the axis of the shaft are called _____ bearings.	j	spring index

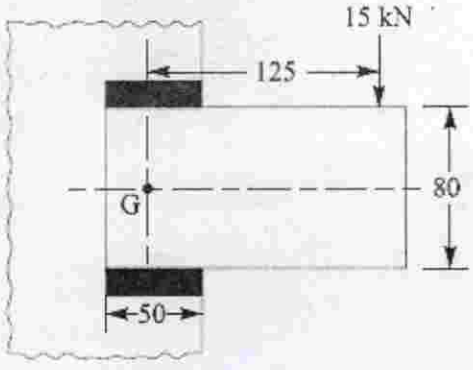
II **Write Short notes on any FIVE of the following** **(5x2=10)**

1. Draw creep curve showing different stages of creep.
2. What is the significance of stress-strain curve?
3. Two plates of 10 mm thickness are to be welded together by means of double transverse fillet welds. The plates are subjected to a load of 80 kN. Find the required length of the weld so that the maximum tensile stress does not exceed 55 MPa.
4. An eye bolt carries a tensile load of 20 kN. Find the size of the bolt, if the tensile stress is not to exceed 100 MPa.
5. A shaft running at 400 rpm transmits 10 kW. Assuming allowable shear stress in shaft as 40 MPa, find the diameter of the shaft.
6. A taper roller bearing has a dynamic load carrying capacity of 26 kN. The desired life for 90% of the bearings is 144 million revolutions. Calculate the equivalent radial load that the bearing can carry.
7. Find the length of belt used in flat belt drive if the centre distance between the shafts is 1620 mm. Diameters of pulleys are 250 mm and 800 mm respectively.

III **Answer any FIVE of the following.** **(5x4=20)**

1. Explain the classification of gear drives.
2. A bracket carrying a load of 15 kN is to be welded as shown in Fig.1. Find the size of weld required if the allowable shear stress is not to exceed 80 MPa.

P T O



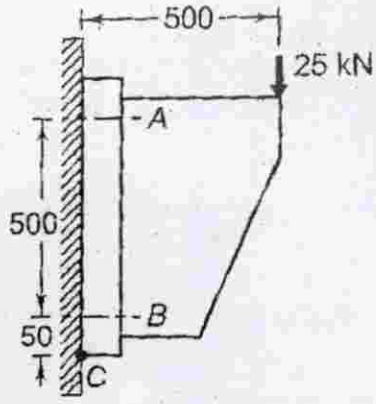


Figure 1 (All Dimensions are in mm.) **Figure 2**

3. A wall bracket is attached to the wall by means of four identical bolts, two at A and two at B, as shown in Fig.2. Assume that the bracket is held against the wall and prevented from tipping about the point C by all four bolts. Using an allowable tensile stress in the bolts as 35 MPa, determine the size of the bolts on the basis of maximum principal stress theory.
4. Design a muff coupling required to connect two steel shafts transmitting 40 kW at 350 r.p.m. The material for the shafts and key 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. Design a spring for a balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casing of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity is 85 kN/mm^2. Also calculate the maximum shear stress induced.
6. A line shaft is driven by means of a motor placed vertically below it. The pulley on the line shaft is 1.5 m in diameter and has belt tensions 5.4 kN and 1.8 kN on the tight side and slack side of the belt respectively. Both these tensions may be assumed to be vertical. If the pulley be overhang from the shaft, the distance of the centre line of the pulley from the centre line of the bearing being 400 mm, find the diameter of the shaft. Assuming maximum allowable shear stress of 42 MPa.
7. A pulley, made of grey cast iron FG150, transmits 10 kW of power at 720 rpm. The diameter of the pulley is 500 mm. The pulley has four arms of elliptical cross-section, in which the major axis is twice the minor axis. Determine the dimensions of the cross-section of the arm, if the factor of safety is 5.

IV **Answer ANY ONE of the following** **1x10=10**

1. Design a cotter joint to connect two circular rods subjected to an axial tensile force of 50 kN.
2. A belt drive transmits 15 kW at a belt speed of 20 m/s approximately and velocity ratio of 3.5. The centre distance is approximately 2.5 times the diameter of the larger pulley. The stress in the belt should not exceed 2.5 N/mm^2. The density of the belt material is 0.97 gm/cc. If the speed of the driven unit is 1750 rpm, determine the belt dimensions.

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