KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Engg) 2016 Admission
V Semester Final Examination-January 2019

Meen.3107 **Machine Design (2+1)**

Marks:50
Time: 2hours

I **Choose the correct Answer** **(10x1=10)**

1 Which of the following material has the maximum ductility?
(a) Mild steel (b) Copper (c) Zinc (d) Aluminium

2 The material commonly used for machine tool bodies is
(a) mild steel (b) aluminium (c) brass (d) cast iron

3 A cotter joint is used to transmit
(a) axial tensile load only. (b) axial compressive load only.
(c) combined axial and twisting loads. (d) axial tensile or compressive loads.

4 In designing a sleeve and cotter joint, the outside diameter of the sleeve is taken as_____
where d = Diameter of the rod.
(a) 1.5 d (b) 2.5 d (c) 3 d (d) 4 d

5 The usual proportion for the width of key is_____
where d = Diameter of shaft.
(a) d/8 (b) d/6 (c) d/4 (d) d/2

6 The sleeve or muff coupling is designed as a
(a) thin cylinder (b) thick cylinder (c) solid shaft (d) hollow shaft

7 Two shafts A and B are made of the same material. The diameter of the shaft A is twice as that of shaft B. The power transmitted by the shaft A will be_____ of shaft B.
(a) twice (b) four times (c) eight times (d) sixteen times

8 In levers, the leverage is the ratio of
(a) load lifted to the effort applied (b) mechanical advantage to the velocity ratio
(c) load arm to the effort arm (d) effort arm to the load arm

9 The material suitable for the belts used in agricultural equipments is
(a) cotton (b) rubber (c) leather (d) balata gum

10 In a full journal bearing, the angle of contact of the bearing with the journal is
(a) 120° (b) 180° (c) 270° (d) 360°

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

1 Define factor of safety. How it will be calculated for ductile and brittle materials?
2 What is the usual taper provided for a cotter in a cotter joint?
3 Discuss the different types of stresses induced in a key.
4 What is the difference between a shaft and axle?
5 Differentiate between hydrostatic and hydrodynamic bearings.
6 If two shafts A and B of solid circular cross-section are identical except their diameters d_A and d_B, then what is the ratio of power transmitted by the shaft A to that of shaft B?
7 What are the various terms used in spur gear terminology?

P.T.O

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

1 State the name of different theories of failure and explain any two of them.

2 Explain different causes of gear tooth failure.

3 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.

4 Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa ; shear stress = 35 MPa and crushing stress = 90 MPa.

5 Design the rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa.

6 A Cast iron pulley transmits 20 kW at 300 r.p.m. The diameter of pulley is 550 mm and has four straight arms of elliptical cross-section in which the major axis is twice the minor axis. Find the dimensions of the arm if the allowable bending stress is 15 MPa. Mention the plane in which the major axis of the arm should lie.

7 Define 'mechanical property' of an engineering material. State any six mechanical properties, give their definitions and one example of the material possessing the properties.

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

1 Crowning in pulley

2. Surge in spring

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