USN | | | | | | | | | | | **15AU63**

Sixth Semester B.E. Degree Examination, June/July 2018
Design of Machine Elements – II

Time: 3 hrs.   Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Use of data handbook is allowed.
3. Assume the missing data suitably.

Module-1

1   a. List the differences between straight and curved beam. **(04 Marks)**

    b. A crane hook of trapezoidal c/s of dimension $\rho \, \frac{1}{2}[120+60] \times 90 \text{ mm}^2$ has an inner radius of curvature of 120 mm. The load line is 15 mm away from the centre of curvature. Determine the safe load that the hook can carry if it is made of steel having an allowable stress of 90 MPa. **(12 Marks)**

OR

2   a. A laminated spring having 6 graduated leaves is simply supported at ends at a distance of 0.9m. It is made of steel having allowable bending stress of 360 MPa. The width and thickness of leaves are 90 mm and 6 mm. Find the safe load that can be carried by this spring at the middle and the deflection under that load. **(10 Marks)**

    b. Explain types of springs and their applications. **(06 Marks)**

Module-2

3   Design a pair of spur gear to transmit 18 kW at 3000 rpm of pinion. The velocity ratio required is 6:1. The design should be as compact as possible. Take $\alpha = 20°$ FDI, $\sigma_p = \sigma_g = 450$ MPa. $Z_1 = 20$ teeth. $c_s = 1.5$. **(16 Marks)**

OR

4   a. Define formative no of teeth for helical gears. **(04 Marks)**

    b. Find the suitable module for a pair of helical gears to transmit 18 kW from a pinion speed of 4000 rpm. The gear is top rotate at 800 rpm. The helix angle is not to be greater than 30°. The teeth are 20° stub involute in diametral place. Take $\sigma_g = \sigma_p = 51.7$ MPa. Assume $Z_1 = 20$. **(12 Marks)**

Module-3

5   a. For Bevel gears, show that virtual no of teeth are $Z_v = \dfrac{Z}{\cos\delta}$. **(04 Marks)**

    b. Two steel bevel gears have been designed for strength to transmit 20 kW. If the gears have the following specifications, find the required hardness considering wear and dynamic load. Assume right angle Bevel gears.

Particular	Pinion	Gear
Z	20	25
α	20° Stub	20° Stub
Module	6 mm	6 mm
b (face width)	40 mm	40 mm
N	1250 rpm	1000 rpm
Material	C-45 steel	C-40 steel
σ_{all}	210 MPa	171 MPa

(12 Marks)

OR

6 Design a worm gear drive for the following data. P = 4 kW. Speed of worm = 960 rpm. I = 16:
Duty hours/day = 12 hours/day. Teeth are 20° stub involute. C_s = 1.25. Select manganese bronz
for gear σ = 137.9 MPa. **(16 Mark**

Module-4

7 a. Design a single plate clutch to transmit 12 kW at 2000 rpm. Select leather for friction lining
μ = 0.4, P = 0.2 MPa, τ_s = 65.72 MPa . Assume D_2 = $3D_1$. **(12 Mark**
   b. Explain types of clutches. **(04 Mark**

OR

8 a. A single block brake with drum diameter of 350 mm is shown in Fig.Q8(a) below. The ang
of contact is 90°. μ = 0.33. Determine the safe power that can be absorbed at 1440 rpm.
(12 Mark

Fig.Q8(a)
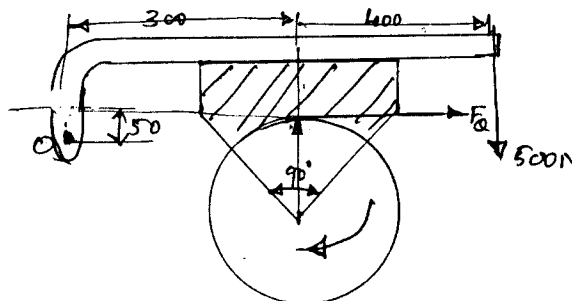
   b. Sketch and explain simple bond brake. **(04 Mark**

Module-5

9 a. Explain different types of rolling contact bearings. **(04 Mark**
   b. A 200 mm diameter bearing is 100 mm long has a load of 30 kN. It runs at 900 rp
Clearance is 0.1 mm. Oil used is SAE40. Operating temperature is 70°C. Find the pow
loss due to friction. **(12 Mark**

OR

10 a. List the assumptions made in hydrodynamic lubrications. **(04 Mark**
   b. A journal bearing is to be designed for the main bearing of a four stroke petrol engine
sustain a load of 50 kN, for the shaft diameter of 50 mm. The engine runs at 1500 rp
Determine
(i) the length of bearing
(ii) the viscosity of the oil to be used as lubricant and suggest suitable oil
(iii) coefficient of friction. **(12 Mark**

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