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Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
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. Missing data suitably assumed.

Module-1

1   The crane hook carries a load of 20kN, as shown in Fig.Q.1. The section at X-X is rectangular whose horizontal side is 100mm. Find the stresses in the inner and outer fibers at the given section. **(16 Marks)**
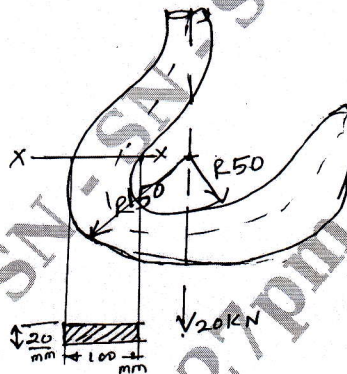

Fig.Q.1

OR

2   a.   Write a note on types of springs. **(04 Marks)**
    b.   A mechanism used in printing machinery contains a tension spring assembled with a preload of 30N. The wire dia of spring is 2mm with a spring index of 6. The spring has 18 active coiles, having following properties τ = 680MPa, G = 80kN/mm^2. **(12 Marks)**

Module-2

3   A bronze spur pinion rotating at 600rpm drives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stresses for the bronze pinion an cast iron gear are 84MPa and 105MPa respectively.
    The pinion has 16 standard 20° full depth involute teeth of mould 8mm. The face width of both the gears is 90mm. Find the power that can be transmitted from the stand point of strength. **(16 Marks)**

OR

4   a.   Define formative number of teeth for Helical gears and write the equation. **(04 Marks)**
    b.   A pair of helical gears are to transmit 15kW. The teeth are 20° stub in diameteral plane and have a helix angle of 45°. The pinion runs at 10000rpm and has 80mm pitch diameter, the gear has 320mm pitch diameter. The gears are made of cast steel of σ = 100MPa. Determine the suitable module. **(12 Marks)**

Module-3

5 A pair of CI bevel gears connect two shaft at right angle the pitch diameter of the pinion and gear are 80mm and 100mm respectively. The tooth profiles of the gears are of 14½° composite form. The allowable static stress for both the gears is 55MPa. If the pinion transmits is 2.75kW at 1100rpm, find the module and number of teeth on each gear from stand point of strength. **(16 Marks)**

OR

6 a. A triple threaded worm gear has teeth of 6mm module and pitch circle diameter of 50mm. The worm gear has 30 teeth of 14½° and the coefficient of friction of the worm gearing is 0.05, find lead angle of worm, velocity ratio, center distance and efficiency of worm gear. **(12 Marks)**

b. Discuss about the wear tooth load of worm gear. **(04 Marks)**

Module-4

7 a. A multi disc clutch has five plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed $0.127N/mm^2$, find the power transmitted at 500rpm. The outer and inner radii of friction surfaces are 125mm and 75mm respectively, take $\mu = 0.3$. **(10 Marks)**

b. Discuss the types of clutch and explain any one with neat sketch. **(06 Marks)**

OR

8 A rope drum of an elevator having 650mm diameter of fitted with a brake drum of 1m diameter. The break drum is provided with four cast iron brake shoes each subtending an angle of 45°. The mass of the elevator when loaded is 2000kg and moves with a speed of 2.5m/sec. The break has a sufficient capacity to stop the elevator in 2.75m. Take $\mu = 0.2$ find width of shoe if the allowable pressure on the break show is $0.3N/mm^2$ and heat generated in stopping elevator. **(16 Marks)**

Module-5

9 a. Explain the principle of hydrodynamic lubrication. **(06 Marks)**

b. The thrust of propeller shaft is absorbed by 6 collars. The rubbing surface of these collars have outer diameter 300mm and inner diameter 200mm. If the shaft runs at 120rpm the bearing pressure amounts to $0.4N/mm^2$. Take $\mu = 0.05$. Assuming that the pressure is uniformly distributed. Determine the power absorbed by the collars. **(10 Marks)**

OR

10 Explain:
a. Bearing characteristic number **(04 Marks)**
b. Sommerfield number **(04 Marks)**
c. Coefficient of friction in bearing **(04 Marks)**
d. Heat generated in bearings **(04 Marks)**

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