

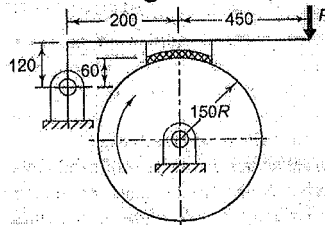
**BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING) 3<sup>RD</sup> YR 1<sup>ST</sup>****SEM EXAM 2019****Machine Design II**

Time:3hrs

(Answer any five from the following)  
(Assume data if missing)

Full marks: 100

- 1.(a) Show that the bending stresses on full-length leaves are 50% more than those in graduated length leaves in a multi-leaf spring. 10
- (b) Using uniform wear theory, show that in a disc clutch torque transmission is maximum when ratio  $R_1/R_2=0.577$ , where  $R_1$ =inner radius and  $R_2$ =outer radius of clutch. Draw a graph between torque and  $R_1/R_2$  ratio. 10
2. (a) A single block brake with a torque capacity of 15 N-m is shown in Fig. below. The coefficient of friction is 0.3 and the maximum pressure on the brake lining is 1 N/mm<sup>2</sup>. The width of the block is equal to its length. Calculate
- the actuating force;
  - the dimensions of the block;
  - the resultant hinge-pin reaction; and
  - the rate of heat generated, if the brake drum rotates at 50 rpm.



- (b) What is the condition for self-locking band brake? 5

3. (a) A single-plate clutch is used to rotate a machine from a shaft rotating at a uniform speed of 300 rpm. Both the sides of the clutch are effective, friction lining is of 140 mm inner diameter and 220 mm outer diameter, respectively, and coefficient of friction between friction lining and flywheel surface is 0.28. Assuming uniform wear theory for clutch, intensity of pressure  $p_{max}=0.1$  Mpa, determine the time required to attain full speed by the machine if moment of inertia of rotating parts is 7.2 kg-m<sup>2</sup>. 10
- (b) A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of a double parallel filets. The plates are subjected to a static load of 80 kN. Find the length of the weld if the permissible shear stress in the weld does not exceed 55 Mpa? 10

4. (a) Derive and sketch the distribution of shear stresses in the wire of helical spring? What is Wahl Factor? Why is it used? 10
- (b) A flywheel of mass 50 kg and radius of gyration 200 mm is rotating at 360 rpm. It is brought to rest by means of brake. The mass of the brake drum assembly is 4 kg. Assuming that the total heat generated is absorbed by the brake drum only. Calculate the temperature rise. Specific heat of the brake drum material is 460J/kg<sup>0</sup>c. 10

5. Cotter joint is used to connect two rods having 50 mm diameter, made of plain carbon steel 40C8 ( $\sigma_{yt}=380 \text{ N/mm}^2$ ). The cotter is made from a steel plate of 10 mm thickness. Calculate the dimensions of the socket end with neat sketch of cotter joint where compressive strength is twice of tensile strength. The factor of safety for the rods, spigot end and socket end is 5 and for cotter is 3. 20

6. (a) A flexible coupling is used to connect 15 kW power at 100 rpm. There are six pins and their pitch circle diameter is 200 mm. The effective length of the bush ( $l_b$ ), the gap between two flanges and the length of the pin in contact with the right hand flange are 35, 5 and 23 mm respectively. The permissible shear and bending stresses for the pin are 35 and 152  $\text{N/mm}^2$  respectively. Calculate: (a) pin diameter by shear consideration; and (b) pin diameter by bending consideration. 15  
(b) Explain the different types of coupling and their use. 5

7. (a) What is the effect of eccentric load when it is applied perpendicular to the axis of the bolt? 10  
(b) Show by neat sketches the various ways in which a riveted joint may fail. 10