B.E / B. Tech(Full Time) END SEMESTER EXAMINATIONS, Apr / May 2012
SIXTH SEMESTER MECHANICAL ENGINEERING Regulation 2004
ME 384 DESIGN OF TRANSMISSION SYSTEMS

Time : 3 hr Max Mark : 100

Usage of Approved Design Data book is permitted

Part A (10 X 2 = 20 mark)

41

1. What are the merits of V- belts over flat belts?
2. Name the parts of bush roller chains.
3. What is meant by "beam strength" in gear design?
4. For a simple gear train with ratio of approximately 3 : 1 , what advantages would be a gear set with 59 teeth and 20 teeth, respectively , have over the one with 60 teeth and 20 teeth?
5. What is the order of efficiency of worm gearing as compared to spur gear gearing? Justify the value.
6. Show that, in worm gearing , sliding velocity $V_s = V_w / \cos \lambda$, in which V_w is the worm tangential velocity and λ is lead angle
7. Why geometric progression series is most preferred series for speed steps of machine tool gear box.?
8. Distinguish between structural diagram and speed diagram in the design of multi speed gear box.
9. What are the advantages of disc brake over drum brake?
10. Compare the band brake and block brake for their advantages and disadvantages.

Part B (5 X 16 = 80 mark)

11 . A leather belt drive is to be designed for driving a winch from an electric motor of 12 k W power. Speed of the motor shaft is 700 rpm and the speed ratio is 4 .Belt position is horizontal and there is considerable variation in the load. Design the drive.

12(a) Design a roller chain to transmit 150 k W from an engine running at 90 rpm to a generator running at 560 rpm. Determine the size of the sprocket , pitch diameter and number of strands required.

OR

(b) In the Fig Q 12 (b) , the gears have a normal modular pitch of 6mm ,normal pressure angle of 20 ° and helix angle of 30 °. The transmitted load is 3560 N . Gear 2 rotates clockwise about the y axis and gear 3 is an idler gear. Find the forces exerted by the gears 2 and 3 on their shafts.

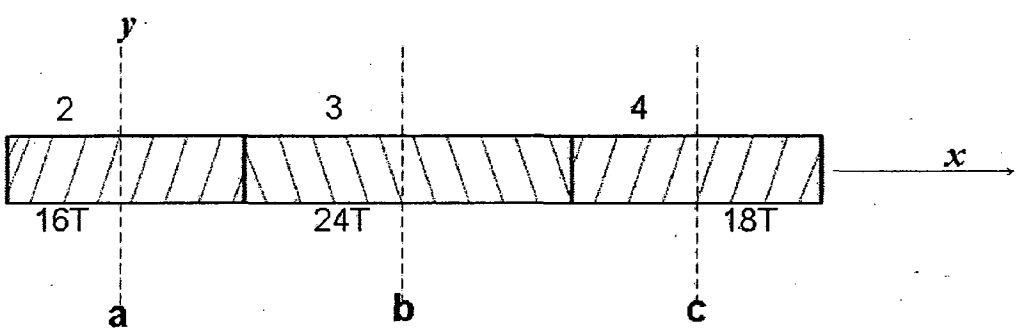

Fig Q 12(b)

Contd..2

13 (a)Design a pair of helical gears to transmit 30 k W power at a speed reduction ratio of 4:1. The input shaft rotates at 2000 rpm Use helix and normal pressure angle equal to 25 ° and 20 ° respectively. Both pinion and gear are made of steel , with maximum permissible stress in the pinion is 55 MPa and in the wheel is 40 MPa .The hardness of the pinion is 340 BHN and it is 300BHN for the gear. The number of teeth on the pinion may be taken as 30.

OR

13 (b) A 2- tooth left hand worm transmits 300 W at 900 rpm to a 36 –tooth gear having a transverse module of 4 mm. The worm has normal pressure angle of 141/2o , pitch diameter of 38 mm, face width of 38 mm Use coefficient of friction of 0.03 find the force exerted by the gear on the worm and the input torque. The worm rotates in clockwise direction about the z-axis in a x-y-z coordinate system. Sketch the arrangement of the gears.

14 (a)The maximum speed at the input shaft of a multi speed gear box is to be 1400 rpm and power is 5 k W. The gear box is to provide six speeds based on R10 series. There are three shafts and three changes are required between the input and intermediate shaft and two changes between intermediate and out put shaft. Draw the kinematic diagram and speed diagram
and find the following :

i. gear ratio between the shaft
ii. number of teeth in each gear
iii. actual value of six output speeds
iv torque on the output shaft for each speed

OR

(b) A 3- speed sliding gear box is to have the following speed ratios as nearly as possible. Bottom gear 5:1 , second gear 3:1 , and top gear 1.5:1 Output shaft and input shaft are coaxial, centre distance which is horizontal between them and the lay shaft is 144 mm. All the gears are to be 4 mm module and none should have less than 20 teeth and pressure angle is 20 °. Determine the suitable number of teeth and sketch the arrangement of the gears and find the actual speeds obtained.

15 (a) A multiple disc wet clutch is to be designed for a machine tool driven by an electric motor of 12. 5 k W running at 1400 rpm. Space restrictions limit the outside dice diameter to 100 mm. Determine appropriate values for disc inside diameter total number of discs and clamping force,

OR

(b) A differential band brake is to be designed for a winch lifting a load of 45 k N through rope wound around a barrel of 500 mm diameter. The brake drum to be keyed to the same shaft is 600 mm in diameter and the angle lap of the brake band over the drum is 250° approximately. Determine width and thickness of the band. Operating arms of the brake are 40 mm and 200 mm . Operating lever is 1.5 m long. Find the force to be applied at the end of the lever.

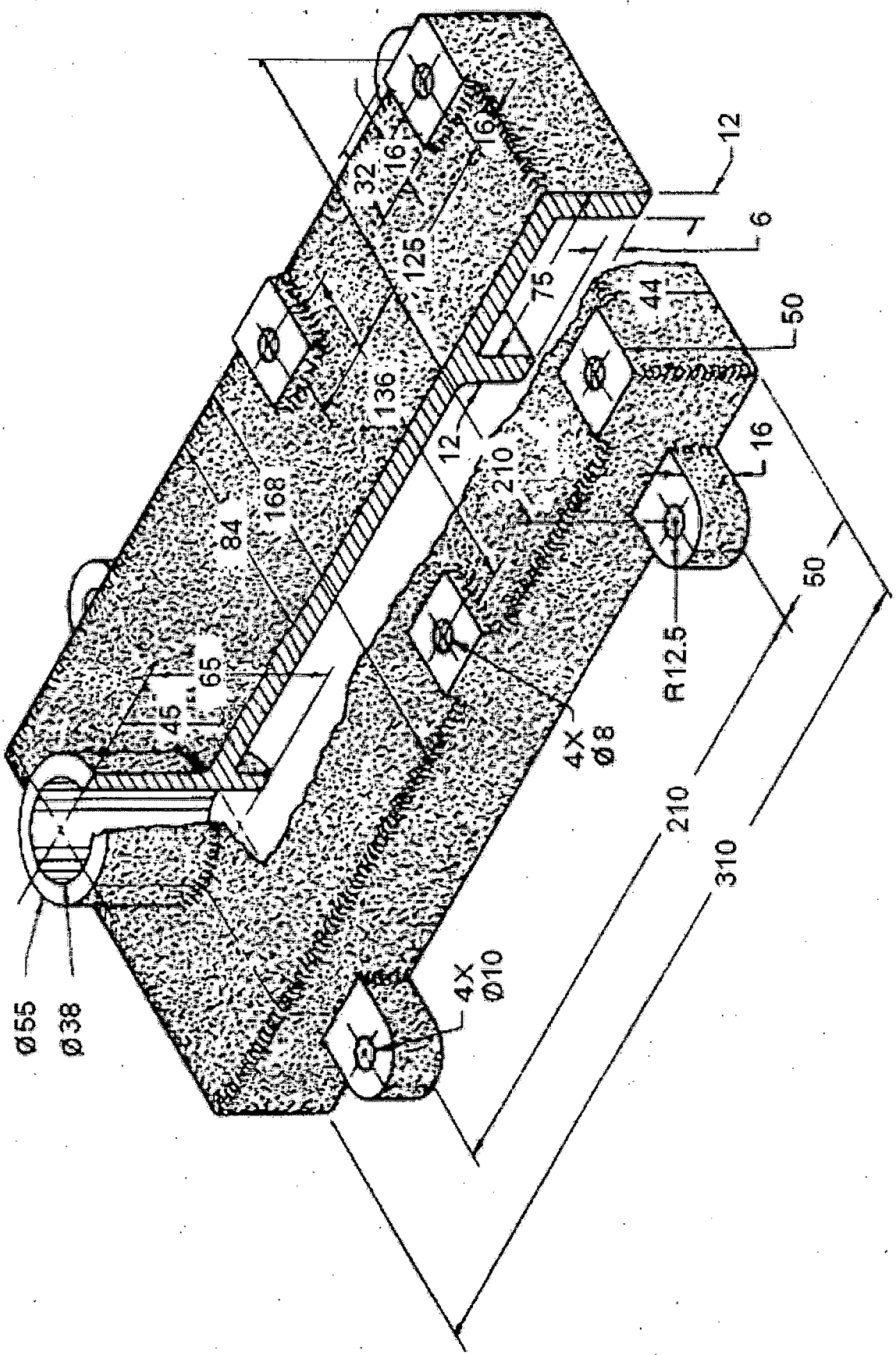

Figure – 1: Drill Base
[as mentioned in Question: **15 a (ii)**]

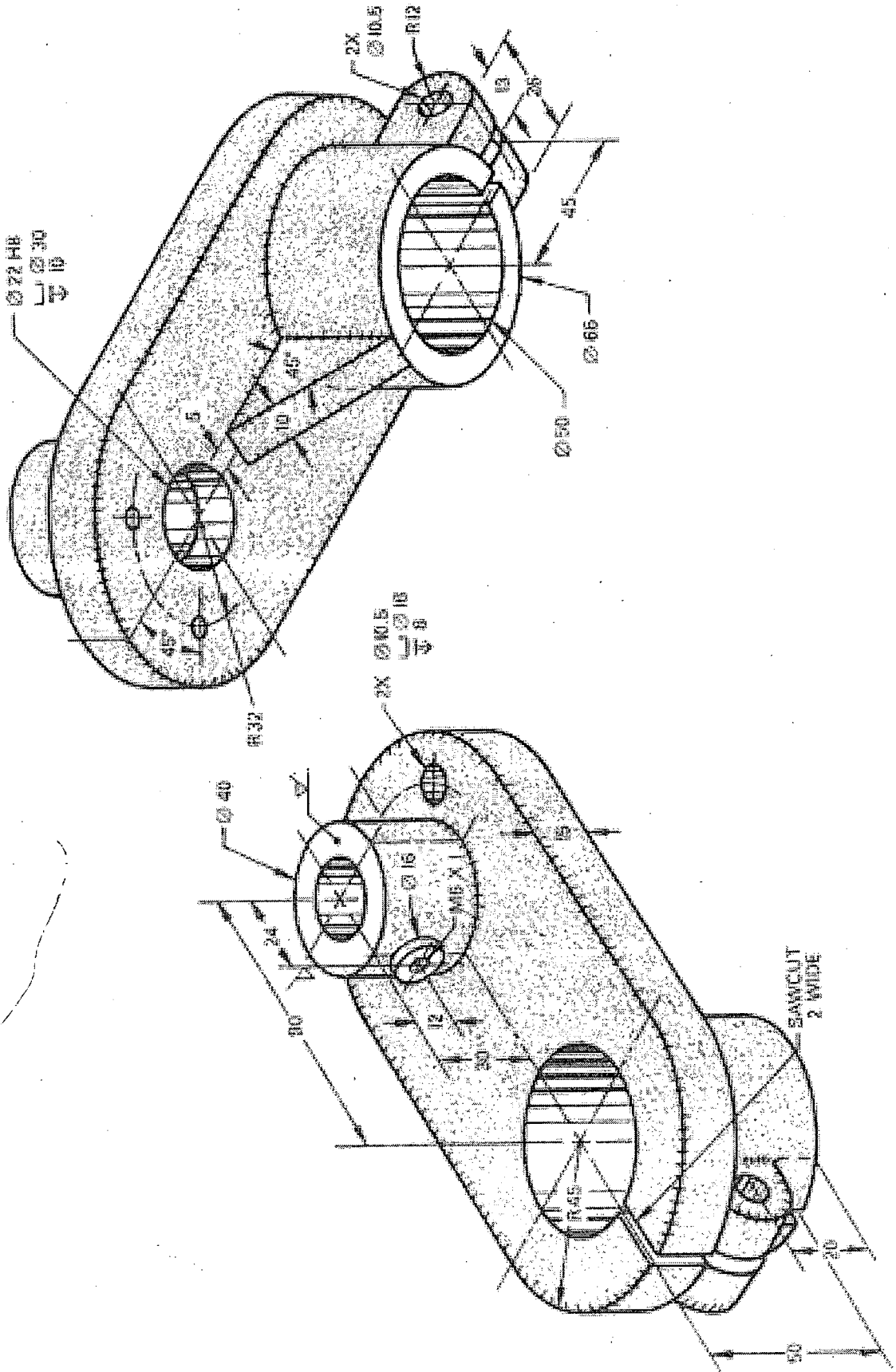

Figure – 2: Swing Bracket
[as mentioned in Question: **15 b (ii)**]