II B.Tech II Semester Regular/Supplementary Examinations,May 2010
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering
Time: 3 hours   Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
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1. Explain the importance of special cams in detail.   [16]

2. (a) Explain the gyroscopic effect of pitching and rolling of a ship in the sea water.

   (b) A ship is pitching through a total angle of 150, the oscillation may be taken as
       simple harmonic and the complete period is 32 sec. The turbine rotor weighs 6
       tones, its radius of gyration is 45 cm and it is rotating at 2400 rpm. Calculate
       the maximum value of gyroscopic couple set up by the rotor. If the rotation
       of the rotor is clockwise looking from left, in which direction will the bow tend
       to turn while falling?
       What is the maximum angular acceleration to which the ship is subjected while
       pitching?   [6+10]

3. The crank of an oil engine is 18.75 cm. long, the connecting rod is 82.5 cm. long
   and the crank rotates at a uniform speed of 310 r.p.m. Calculate the velocity and
   the acceleration of the piston for crank positions of 45^0 and 90^0.   [16]

4. A plate 10mm thick, subjected to a tensile load of 20kN is shown in Figure 4.
   This plate is made of cast iron (S_{ut} =350 N/mm^2) and the factor of safety is
   2.5.Determine the fillet radius.   [16]
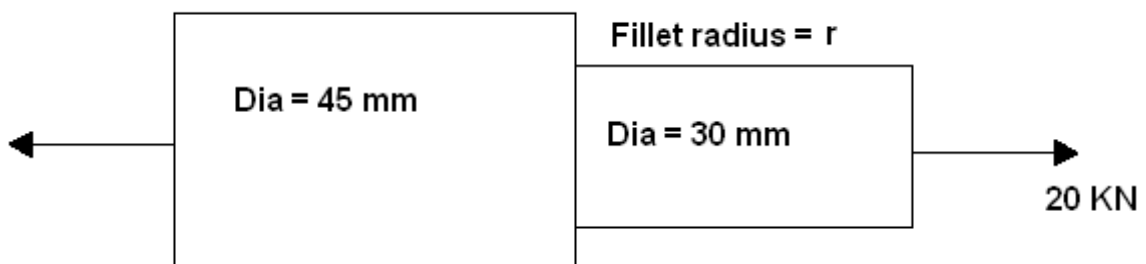

Figure 4

5. Locate all the instant centres of an oscillating cylinder engine mechanism for any
   one configuration and discuss the velocity analysis of the mechanism. Assume the
   link proportions and the speed of the crank.   [16]

6. What is the difference between the slider-crank chain and the double slider-crank
   chain? Draw the three mechanisms which are inversions of each of the above chains
   and state the purpose for which each mechanism is used.   [8+8]

7. A flat faced reciprocating follower has the following motion:

(a) The follower moves outward for 90^0 of cam rotation with uniform acceleration and retardation, acceleration being twice the retardation,

(b) The follower dwell for the next 60^0 of cam rotation,

(c) The follower moves to the initial position for the next 120^0 of cam rotation with uniform acceleration and retardation, acceleration being twice the retardation,

(d) the follower dwells for the remaining period.

The base circle diameter of the cam is 80 mm and stroke of the follower is 30 mm. The line of movement of the follower passes through the cam centre. Draw the displacement diagram. [16]

8. Determine the suitable train of wheels to satisfy the requirements of a clock, the minute hand of which is fixed to a spindle and the hour hand to a sleeve rotating freely on the same spindle. The pitch is the same for all the wheels and each wheel has at least 11 teeth. The total number of teeth should be as small as possible.[16]

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