

Code :R5320304

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III B.Tech II Semester(R05) Supplementary Examinations, April/May 2011
DYNAMICS OF MACHINERY
(Mechanical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1. (a) Deduce an expression for the couple for the case of the wheel rotating with uniform angular velocity in order to maintain a given precision.
 (b) Two pairs of locomotive driving wheels run around a curve of mean radius of 300m at 14m/sec. The mass of each pair of wheels is 5600N and the diameter is 120cms and the radius of gyration is 45cms. Find the gyroscopic couple and state whether it tends to turn the locomotive about the inside or outside rails.
2. (a) Derive the expression for the torque required to lift the load by a screw jack.
 (b) The pitch of 50 mm mean diameter threaded screw of screw jack is 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25kN, assuming the load to rotate with the screw. Determine the ratio of the torque required to raise the load to the torque required to lower the load and also the efficiency of the machine.
3. (a) Describe with neat sketch the fottinger torsion dynamometer.
 (b) A simple band brake is operated by a lever of length 500mm. The brake drum has a diameter of 500mm and the brake band embraces 5/8th of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100mm from the fulcrum. If the effort applied to the end of the lever is 3kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum.
4. A gas engine has a bore of 12 cm and a stroke of 24 cm and runs at 300 rpm the connecting rod is 5 times the crank and weighs 600 N and has a radius of gyration of 16 cm about the centre of gravity which is 20 cm from the crank pin center determine the magnitude and direction of the inertia force on the rod and the corresponding torque on the crank shaft when the crank has moved to 135 degrees from the inner dead center.
5. A Porter governor carries a central load of 30 kgf and each ball weighs 4.5 kgf. The upper links are 20cm long and the lower links are 30 cms long. The points of suspension of upper and lower links are 5cms from axis of spindle. Calculate:
 - (a) The speed of the governor in rpm if the radius of revolution of the governor ball is 12.5 cm and
 - (b) The effort of the governor for increase of speed of 1%.
6. Four masses A, B, C and D are completely balanced. Masses C and D make angles of 90° and 195° respectively with B in the same sense. The rotating masses have following properties.

$m_b = 25 \text{ kg}$	$r_a = 150 \text{ mm}$
$m_c = 40 \text{ kg}$	$r_b = 200 \text{ mm}$
$m_d = 35 \text{ kg}$	$r_c = 100 \text{ mm}$
	$r_d = 180 \text{ mm}$

planes B and C are 250 mm apart. Determine:

 - (a) The mass A and its angular position.
 - (b) The positions of planes A and D.
7. A four coupled-wheel locomotive with two inside cylinders has reciprocating and revolving parts per cylinder as 300 kgf and 250 kgf respectively. The distance between planes of driving wheels is 150 cms. The pitch of cylinders is 60 cms. The diameter of tread and driving wheels is 190 cms and the distance between planes of coupling rod cranks is 190 cms. The revolving parts for each coupling rod crank are 125 kgf. The angle between engine cranks is 90° and the length of coupling rod crank 22 cms. The angle made by coupling rod crank with adjustment crank is 18° . The distance of center of gravity of balance weights in planes of driving wheels from a scale center is 75 cms. Crank radius is 32 cms. Determine:
 - (a) The magnitude and position of balance weights required in leading and trailing wheels to balance 2/3 of reciprocating and whole of revolving parts if half of the required reciprocating parts are to be balanced in each pair of coupled wheels.
 - (b) The maximum variation of tractive force and hammer blow when locomotive speed is 100kmph.
8. Explain two rotor and three rotor vibrations.

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