

Code No: R31033/R10**III B.Tech I Semester Supplementary Examinations, November - 2015****DYNAMICS OF MACHINERY****(Common to ME, AME)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions
All Questions carry equal marks**

- 1 a) Explain the effect of precession motion on the stability of moving vehicles such as motor car? [6]
b) The moment of inertia of a pair of locomotive driving wheels with the axle is 200 kg m^2 . The distance between the wheel centers is 1.6m and the diameter of the wheel treads is 1.8m. Due to defective ballasting, one wheel falls by 5mm and raises again in a total time of 0.12 second while the locomotive travels on a level track at 100 km/h. assuming that the displacement of the wheel takes place with simple harmonic motion, determine the gyroscopic couple produced and the reaction between the wheel and rail due to this couple. [9]
- 2 a) Explain the terms of friction couple, friction axis and film lubrication? [6]
b) A power screw driven by an electric motor moves a nut in horizontal plane when a force of 80 kN at a speed of 6mm/s is applied. This screw is of single thread of 8mm pitch and 48mm major diameter. Determine the power of the motor if the coefficient of the friction at the screw threads is 0.1. [9]
- 3 a) A car moving on a level road at a speed 60 kmph, has a wheel base 3 m, distance of C.G from ground level 600mm, and the distance of C.G from rear wheels is 1.2 m. Find the distance travelled by the car before coming to rest when brakes are applied, (i) to the front wheels only, (ii) to the rear wheels only and (iii) to all the four wheels. Take coefficient of friction between the tyres and the road as 0.6. [8]
b) What is self-energizing brake? Derive 'self-locking conditions' for a differential band brake when drum rotates in clockwise direction. [7]
- 4 A machine has to carry out punching operation at the rate of 10 holes per minute. It does 6 kN-m of work per mm^2 of the sheared area on cutting 25 mm diameter holes in 20mm thick plates. A flywheel is fitted to the machine shaft which is driven by a constant torque. The fluctuation of speed is between 180 and 200 rpm. The actual punching takes 1.5 seconds. The frictional losses are equivalent to 1/6 of the work done during punching. Find: a) Power required to drive the punching machine and b) Mass of the flywheel, if the radius of gyration of the wheel is 0.5m. [15]

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- 5 a) What are the differences between Porter and Proell Governors? Why the speed range of Proell governor is less than that of a similar Porter type? [8]
- b) The lengths of the upper and lower arms of a Porter governor are 200mm and 250mm respectively. Both the arms are pivoted on the axis of the rotation. The central load is 150N, the weight of each ball is 20N and the friction of the sleeve together with the resistance of the operating gear is equivalent to a force of 30N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40° , determine the range of speed of the governor. [7]
- 6 A single cylinder horizontal engine runs at 120 r.p.m. The length of stroke is 400 mm. [15]
The mass of the revolving parts assumed concentrated at the crank pin is 100 kg and mass of reciprocating parts is 150 kg. Determine the magnitude of the balancing mass required to be placed opposite to the crank at a radius of 150mm which is equivalent to all the revolving and $\frac{2}{3}$ rd of the reciprocating masses. If the crank turns 300° from the inner dead centre, find the magnitude of the unbalanced force due to the balancing mass.
- 7 a) Prove that a maximum secondary unbalanced force is $1/n$ times the maximum primary unbalanced force for 'n' cylinders reciprocating engine. [8]
- b) For radial engines with an odd number of cylinders prove that the primary force may be balanced by attaching single mass of $\frac{m}{k}$ where 'k' is number of cylinders and 'm' is mass of reciprocating parts. [7]
- 8 a) Explain about free Vibration of spring mass system? [6]
- b) A shaft of 10cm diameter and 100cm long is fixed at one end and other end carries a flywheel of mass 80kg. Taking Young's modulus for the shaft material as $2 \times 10^6 \text{ Ks/cm}^2$. Find the natural frequency of longitudinal and transverse vibrations. [9]
