**Exam. Code: 0940**
**Sub. Code: 33857**

**2015**
**B.E. (Mechanical Engineering)**
**Fourth Semester**
**MEC-403: Dynamics of Machines**

**Time allowed: 3 Hours** **Max. Marks: 50**

***NOTE:*** ***Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.***

-*-*-*-

| | | |
|---|---|---|
| 1 | (a) Write the three conditions for equivalent dynamical system.<br>(b) What is the significant role of correction couple in inertia force analysis?<br>(c) Explain the function of idlers in a gear train.<br>(d) What is coupled locomotives?<br>(e) What is the significant role of a pressure angle in cam? | (2x 5) |
| | **Section A(Attempt any two questions )** | |
| 2 | **(a)**Derive an expression to find out the Inertia torque of reciprocating engine by analytical method.<br><br>**(b)** Two shafts with an included angle of 160° are connected by a Hooke's joint. The driving shaft runs at a uniform speed of 1500 r.p.m. The driven shaft carries a flywheel of mass 12 kg and 100 mm radius of gyration. Find the maximum angular acceleration of the driven shaft and the maximum torque required | 5<br><br>5 |
| 3 | **(a)** Explain the application of gyroscopic principles to aircrafts.<br><br>**(b)** A four wheeled motor car of mass 2000 kg has a wheel base 2.5 m, track width 1.5 m and height of centre of gravity 500 mm above the ground level and lies at 1 metre from the front axle. Each wheel has an effective diameter of 0.8 m and a moment of inertia of 0.8 kg-m2.The drive shaft; engine flywheel and transmission are rotating at 4 times the speed of road wheel, in a clockwise direction when viewed from the front, and is equivalent to a mass of 75 kg having a radius of gyration of 100 mm. If the car is taking a right turn of 60 m radius at 60 km/h, find the load on each wheel. | 3<br><br>7 |
| 4 | Draw the profile for the disc cam offset 20mm to the right of the centre of the cam shaft. The base circle diameter is 75mm and the diameter of the roller is 10mm.The follower is to move outward a distance of 40mm with S.H.M. in 140° of the cam rotation to dwell for 40° of cam rotation to move inward with 150° of cam rotation with uniform acceleration and retardation. Calculate the maximum velocity and acceleration of the follower during each stroke if the cam-shaft rotates at 90 r.p.m. | 10 |
| | **Section B(Attempt any two questions )** | |
| 5 | **(a)**Write a short note on<br>(i) Swaying couple.<br>(ii) Hammer Blow.<br><br>**(b)** A V-twin engine has the cylinder axes at right angles and the connecting rods operate a common crank. The reciprocating mass per cylinder is 11.5 kg and the crank radius is 75 mm. The length of the connecting rod is 0.3 m. Show that the engine may be balanced for primary forces by means of a revolving balance mass. If the engine speed is 500 r.p.m. What is the value of maximum resultant secondary force? | 5<br><br>5 |

**P.T.O.**

| | | |
|---|---|---|
| 6. | **(a)** Derive an expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel.<br><br>**(b)** A pair of spur gears with involute teeth is to give a gear ratio of 4: 1. The arc of approach is not to be less than the circular pitch and smaller wheel is the driver. The angle of pressure is 14.5°. Find: 1. the least number of teeth that can be used on each wheel, and 2. The addendum of the wheel in terms of the circular pitch ? | 5<br><br>5 |
| 7 | **(a)**Explain compound gear train with the help of diagram.<br><br>**(b)**Two shafts A and B are co-axial. A gear C (50 teeth) is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110rpm, find the speed of shaft B. | 3<br><br>7 |

*x-x-x*