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B.Tech. DEGREE EXAMINATION, NOVEMBER 2012
Fourth Semester

ME0208 – MACHINES AND MECHANISMS
(For the candidates admitted from the year 2007-2008 onwards)

Time: Three hours

Max. Marks: 100

Answer ALL Questions

PART – A (10 × 2 = 20 Marks)

1. What is flexible link?
2. What is force-closed pair?
3. What is pantograph?
4. Define: Pressure angle of cam.
5. Differentiate pitch and lead.
6. Where multiple disc clutches are used?
7. List out the types of gear trains.
8. What is Gyroscope?
9. Define: Coefficient of fluctuation of energy.
10. Why is balancing of rotating parts necessary for high speed engines?

PART – B (5 × 16 = 80 Marks)

11. a. Explain the following in detail.
 - (i) Crank and Slotted quick return motion mechanism (12 Marks)
 - (ii) Oscillating cylinder engine (4 Marks)

(OR)

- b. In a toggle mechanism shown in figure, the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter clockwise direction at a speed of 180 rpm increasing at the rate of 50 rad/sec². The dimensions of the various links are as follows:

- b. The mass of the turbine rotor of a ship is 20 tonnes and has a radius of gyration of 0.6 m. Its speed is 2000 rpm. The ship pitches 6° above and 6° below the horizontal position. A complete oscillation takes 30 seconds and the motion is a simple harmonic. Determine
 - (i) Maximum gyroscopic couple
 - (ii) Maximum angular acceleration of the ship during pitching

15. a. The torque delivered by a two stroke engine is represented by $T = (1200 + 1400\sin\theta + 210\sin2\theta + 21\sin3\theta)$ N-m, where θ is the angle turned by the crank from the inner dead centre. The engine speed is 210 rpm. Determine the power of the engine and the minimum mass of the flywheel if its radius of gyration is 800 mm and the maximum fluctuation of speed is to be $\pm 1.5\%$ of the mean.

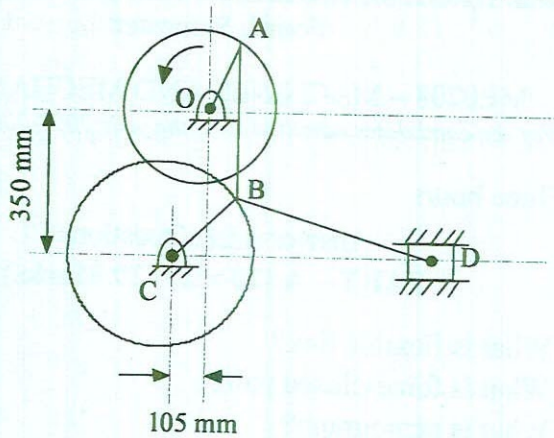
(OR)

- b. A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured counter clockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolved at a radius of 100 mm, find their magnitudes and angular positions.

* * * *

OA=180 mm, CB=240 mm, AB=360 mm, BD=540mm.
Determine

- (i) Velocity and acceleration of slider D
- (ii) Angular velocity and Acceleration of BD



12. a. Explain the expression for Davis steering gear with neat sketch.

(OR)

b. A disc cam rotating in a clockwise direction is used to move a reciprocating roller with uniform acceleration and retardation motion in a radial path is given below.

- (i) Outstroke with maximum displacement of 25 mm during 120° of cam rotation.
- (ii) Dwell for 60° at cam rotation
- (iii) Return stroke maximum displacement of 25 mm during 90° of cam rotation and
- (iv) Dwell during remaining 90° of cam rotation

The minimum radius of cam is 20 mm.

13. a. Find the load that can be lifted by applying a force of 220 N at the end of 500 mm long lever of screw jack using single start square threads. The load does not rotate with the spindle and is carried on a swivel head having a bearing of 100 mm diameter. The pitch of the threads is 10 mm and the root diameter is 50 mm. Coefficient of friction

between nut and thread is 0.18 and between spindle and swivel head is 0.15. Find also the efficiency of the jack.

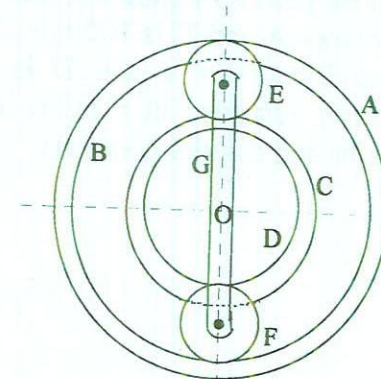
(OR)

b. A cone clutch is to transmit 7.5 kW at 900 rpm. The cone has a face angle of 12° . The width of the face is half of the mean radius and the normal pressure between the contact surfaces is not to exceed 0.09 N/mm^2 . Assuming uniform wear and coefficient of friction between contact faces as 0.2. Find the main dimensions of the clutch and the axial force required to engage the clutch.

14. a. In an epicyclic gear train shown in figure. The inner wheels 'A' and 'B' and compound wheels 'C' and 'D' rotate independently about axis 'O'. The wheels 'E' and 'F' rotate on pins fixed to the arm 'G'. 'E' gears with 'A' and 'C' and 'F' gears with 'B' and 'D'. All the wheels have the same module and the number of the teeth are:

$$T_C = 28, T_D = 26, T_E = T_F = 18.$$

- (i) Sketch the arrangement.
- (ii) Find the number of teeth on 'A' and 'B'.
- (iii) If the arm 'G' makes 100 rpm clockwise and 'A' is fixed, find the speed of 'B'.
- (iv) If the arm 'G' makes 100 rpm clockwise and wheel 'A' makes 10 rpm counter clockwise. Find the speed of wheel 'B'.



(OR)