

Register Number:

B.E. DEGREE EXAMINATIONS: NOV/DEC 2012

Third Semester

AUTOMOBILE ENGINEERING

AUE101: Mechanics of Machines

Time: Three Hours

Maximum Marks: 100

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. In a four link mechanism, the sum of the shortest and the longest link is less than the sum of the other two links. It will act as crank rocker mechanism if
 - A. The link opposite to the shortest link is fixed
 - B. The shortest link is fixed
 - C. Any link adjacent to the shortest link is fixed
 - D. The shortest link is movable
2. The instantaneous centre of rotation of a circular disc rolling on a straight path is
 - A. At the centre of the disc
 - B. At their point of contact
 - C. At the centre of gravity of the disc
 - D. At infinity
3. The efficiency of a screw jack depends on
 - A. Pitch of threads
 - B. Load
 - C. Both pitch and load
 - D. Neither pitch nor load
4. No force is required for downward motion of a load on a screw jack if
 - A. α less than \emptyset
 - B. α less than \emptyset
 - C. α less than $2\emptyset$
 - D. α greater than \emptyset
5. The contact ratio of gear is always
 - A. More than one
 - B. one
 - C. Less than one
 - D. zero
6. The reference point on the follower to lay the cam profile is known as the
 - A. Cam center
 - B. Pitch point
 - C. Trace point
 - D. Prime point
7. Magnitude of the secondary force is ----- the primary force
 - A. More than
 - B. Less than
 - C. Equal to
 - D. One half

8. In a single reciprocating engines the primary unbalanced force
 - A. Cannot be balanced
 - B. Can be fully balanced
 - C. Can be partially balanced
 - D. Is zero
9. The frequency of damped vibration is always ----- the natural frequency
 - A. Equal to
 - B. More than
 - C. Less than
 - D. Double
10. A reduction in amplitude of successive oscillations indicate ----- vibrations
 - A. Dynamic Magnification
 - B. Amplitude Reduction force
 - C. Logarithmic decrement
 - D. Damping coefficient

PART B (10 x 2 = 20 Marks)

11. List the types kinematic pairs according to the type of closure
12. State the difference between machine and structure
13. List the types of dynamic friction
14. Write the expression for frictional torque transmitted in a conical pivot bearing considering uniform wear
15. How will you classify the followers according to the surface in contact
16. List any five terms used in the nomenclature of radial cam
17. What are the conditions to be satisfied for dynamic balancing
18. What are the effects of an unbalanced primary force along the line of stroke of a two cylinder locomotive engine
19. List any three types of vibrating motion
20. Define whirling speed of shaft

PART C (5 x 14 = 70 Marks)

- 21.a) In the mechanism shown below, the crank OA rotates at 20 rpm counter clockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300mm AB = 1200mm BC = 450 mm and CD = 450mm Find
 1. Velocities of sliding C & D
 2. Linear acceleration of D

the cam is 40mm .The follower is provided with a roller of radius 20mm and its line of stroke passes through the axis of the Cam.

24. a) A single cylinder reciprocating engine has speed 240rpm, stroke 300mm,mass of reciprocating parts is 50 kg,the mass of revolving parts at 150mm radius is 37kg.If two third of the reciprocating parts and all the revolving parts are to be balanced. Find the balance mass required at a radius of 400mm.The residual unbalanced forced when the crank has rotated 60degree from inner dead centre.

(OR)

- b) A five cylinder in line engine running at 750 rpm has successive cranks 144degrees apart. The distance between the cylinder centre lines being 375mm.The piston stroke is 225mm and the ratio of the connecting rod to the crank is 4. Examine the engine for balance of primary and secondary forces and couples. Find the maximum values of these and the position of the central crank at which these values occur. The reciprocating mass for each cylinder is 15 kg
25. a) A machine part having a mass of 2.5 kg vibrates in a viscous medium. A harmonic exciting force of 30 N acts on the part causes a resonant amplitude of 14mm with a period of 0.22 sec. Find the damping coefficient. If the frequency of the exciting force is changed to 4 Hz, determine the increase in the amplitude of the forced vibration upon the removal of the damper.

(OR)

- b) A reciprocating IC engine is coupled to a centrifugal pump through a pair of gears. The shaft from the flywheel of the engine to the gear wheel has a 48mm diameter and is 800 mm long. The shaft from the pinion to the pump has 32 mm diameter and is 280mm long. Pump speed is four times the engine speed. Moments of inertia of flywheel ,gear whell,pinion and pump impeller are $1000\text{kg}\cdot\text{m}^2$, $14\text{ kg}\cdot\text{m}^2$, $5\text{ kg}\cdot\text{m}^2$,and $18\text{ kg}\cdot\text{m}^2$ respectively.Find the natural frequency of the torsional Oscillations of the system.

$$G = 80\text{GN}/\text{m}^2$$
