B.E./B.Tech. (FULL - TIME) ARREAR EXAMINATIONS APRIL / MAY 2011

(Common to Printing , Manufacturing and Industrial)

III SEMESTER – (REGULATIONS 2004)

ME 550 – MECHANICS OF MACHINES

Time: 3 hours Maximum marks: 100.

PART – A (10 x 2 = 20 Marks)

1. Write the expression for the acceleration of the follower at the beginning of the lift for a symmetrical tangent cam operating a roller follower
2. Find the number of binary joints for the chain shown in figure 1.

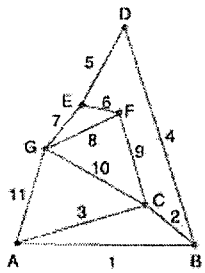

Fig 1.

3. What do you meant by dynamically equivalent systems
4. Define train value and speed ratio of a simple gear train
5. What is the difference between compound and reverted gear train
6. Write the expression for the maximum efficiency of a screw jack
7. Write the condition for maximum power transmission in belt drive
8. Give the static equilibrium condition for three force members
9. Write the expression for the natural frequency of torsional vibration of a single rotor system and draw its mode shape.
10. Define transmissibility and write the expression for transmissibility under resonance conditions

PART – B (5 x 16 = 80 Marks)

11. The following particulars relate to a symmetrical circular cam operating a flat faced follower. Least radius 16mm, nose radius =3.2 mm, distance between cam shaft centre and nose centre 25mm, angle of action of cam 150° and cam shaft speed 600 r.p.m. Assuming that there is no dwell between ascent t or descent , determine the lift of the valve, the flank radius and the acceleration and retardation of the follower at a point where circular nose merges into circular flank.

12. (a) An epicyclic gear train as shown in fig 2, has a sun wheel S of 30 teeth and two planet wheels P-P of 50 teeth. The planet wheels mesh with the internal teeth of a fixed annulus A. The driving shaft carrying the sun wheel, transmits 4 kW at 300 rpm. The driven shaft is

connected to an arm which carries the planet wheels. Determine the speed of the driven shaft .

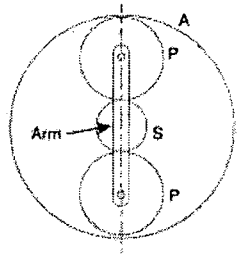

Fig 2.

(OR)

12.(b)A pair of involute spur gears with 16° pressure angle and pitch of module 6mm is in mesh. The number of teeth on pinion is 16 and its rotational speed is 240 rpm. When the gear ratio is 1.75, find in order that the interference is just avoided 1.the addenda on pinion and gear wheel 2. the length of path of contact and 3. the maximum velocity of sliding of teeth on either side of the pitch point.

13.(a)A pulley used to transmit power by means of ropes has a diameter of 3.6 metres and has 15 grooves of 45° angle . The angle of contact is 170° and the co-efficient of friction between the ropes and the groove sides is 0.28. The maximum possible tension in the ropes is 960N and the mass of the rope is 1.5kg per meter length. What is the speed of the pulley in rpm and power transmitted if the conditions of maximum power prevail?

(OR)

13. (b) The cutter of a broaching machine is pulled by square threaded screw of 55mm external diameter and 10mm pitch. The operating nut takes the axial load of 400 N on a flat surface of 60mm internal diameter and 90 mm external diameter. If the co-efficient of friction is 0.15 for all contact surfaces on the nut, determine the power required to rotate the operating nut, when the cutting speed is 6 m/min.

14. (a)A shaft has three eccentrics, each 75mm diameter and 25mm thick, machined in one piece with the shaft. The central planes of the eccentric are 60mm apart. The distance of the centres from the axis of the rotations are 12mm, 18mm and 12mm and their angular positions are 120° apart. The density of metal is 7000 kg/m^3. Find the amount of out-of-balance force and couple at 600 rpm. If the shaft is balanced by adding two masses at a radius 75mm and at distances of 100mm from the central plane of the middle eccentric, find the amount of masses and their angular positions.

(OR)

14.(b) A shaft 1.5m long supported in flexible bearings at the ends carries two wheels each of 50kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 375mm from the centre towards left. The shaft is hollow of external diameter 75mm and internal diameter 40mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2. Find the lowest whirling speed of the shaft, taking into account the mass of the shaft.

15. (a) A four link mechanism as shown in fig 3.with the following dimensions is acted upon by a force 80< 150° N on link DC. Length of links as AD = 50mm, AB = 40mm, BC =100mm, DC = 75mm, DE = 35mm. Determine the input torque T on the link AB for the static equilibrium of the mechanism for the given configuration.

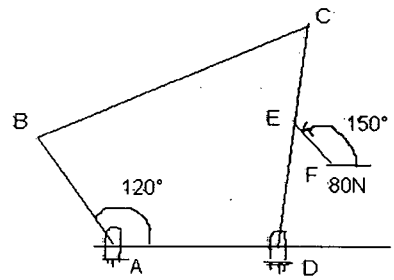

Fig 3.

(OR)

15.(b)A horizontal gas engine running at 210rpm has a bore of 220mm and a stroke of 440mm. The connecting rod is 924 mm long and the reciprocating parts weigh 20kg.When the crank has turned through an angle of 30° from the inner dead centre, the gas pressures on the cover and the crank sides are 500kN/ m^2 and 60kN/ m^2 respectively. Diameter of the piston rod is 40mm. Determine 1.turning moment on the crank shaft 2.thrust on the bearings 3. acceleration of the flywheel which has a mass of 8kg and radius of gyration of 600mm while the power of the engine is 22kW.