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JAYA GROUP OF INSTITUTIONS-THIRUNINRAVUR
4th SEM– B.E. / B.Tech
INTERNAL ASSESSMENT-II(MODEL EXAM-II)

Sub. Name: MECHANICS OF MACHINES
Sub. Code: AT 6302
Duration: 180 minutes

Date: 9 -03-2015
Branch: Aeronautical
Max.Marks: 100

PART-A (10 x 2 =20)

1. Define the term vibration isolation and transmissibility
2. What is meant by whirling speed and torisonally equivalent shaft
3. Define static balancing and dynamic balancing .State the necessary condition to achieve them
4. Explain why only a part of the unbalanced force due to reciprocation masses is balanced by revolving mass?
5. What is meant by a reverted gear train and state at least 2 application
6. What is interference in a gear and how it is prevented ?
7. Define the following w.r.t gears
(i) module (ii) Circular pitch (iii) Pressure angle
8. Define : Tractive force (ii) Hammer blow
9. What are the roles of 'Idlers' in gear trains
10. Define Interchangable gears and Non standard gear teeth

PART-B (5 x 16 =80)

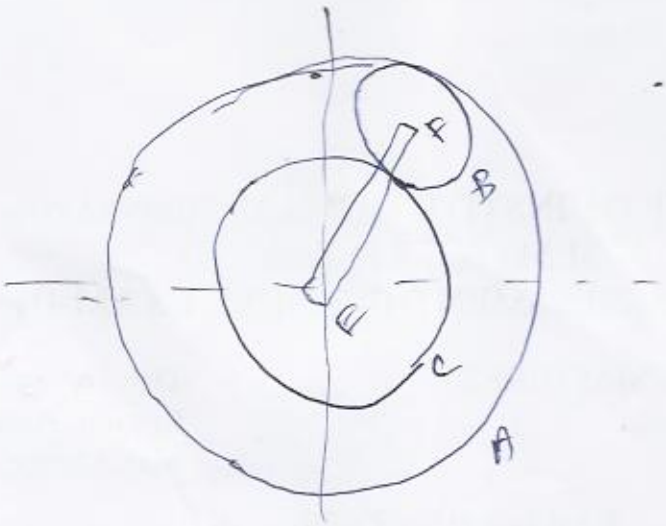
11 (a) (i) A pair of gears,having 40 and 20 teeth respectively,are rotating in mesh,the speed of the smaller being 2000 rpm.Determine the velocity of sliding between the gear tooth faces at the engagement , at the pitch point, and at the point of disengagement if the smaller gear is the driver.Assume that the gear teeth are 20° involute form,addemdum length is 5 mm and the module is 5 mm.Also find the angle through which the pinion turns while any pairs of teeth are in contact (10)
(ii) Derive the expression for minimum number of teeth in pinion in order to avoid interference (6)

(Or)

11 (b)(i) The following data refer to two mating gears of 20° pressure angle: Number of teeth on pinion: 20. Gear ratio: 2 Speed of the pinion:·250 rpm. Module: 12mm.If the addendum of each wheel is such that the path of approach and pat h of recess on each side are half of maximum possible length each,find (i)addendum for both the wheels (ii) the length of arc of contact and (iii)the maximum sliding velocity during approach and recess (10)
(ii)State and Prove law of gearing (6)

12 (a) (i) In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise (8)

(ii) An epicyclic gear consists of three gears A, B and C as shown in Fig.The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both Aand C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m.. If the gear A isfixed, determine the speed of gears B and C. (8)



(Or)

12 (b) *I*n an epicyclic gear train, the internal 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 teeth are : $T_C = 28$; $T_D = 26$; $T_E = T_F = 18$. **1.** Sketch the arrangement ; **2.** Find the number of teeth on A and B ; **3.** If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B ; and **4.** If the arm G makes 100 r.p.m. clockwise and wheel A makes 10 r.p.m. counter clockwise ; find the speed of wheel B. (16)

13 (a) A shaft carries four rotating masses A,B,C and D in this order along its axis. The mass A may be assumed concentrated at a radius of 300 mm,B at 375 mm , C at 350 mm and D at 450 mm. The masses A,C and D are 6.85 kg , 4.5 kg and 3.6 kg respectively .The planes of revolution of A and B are 375 mm apart and B and C are 150mm apart.The angle between the radii of A and C is 90°.Determine :
(i) The angles between the radii A,B and D (ii) T he distance between the planes of revolution of C and D (iii) The value of mass B so that the mass may be perfect balance (16)

(Or)

13 (b) A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190°, both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine : **1.** The magnitude of the masses at A and D ; **2.** the distance between planes A and D ; and **3.** the angular position of the mass at D.(16)

14 (a) A rotating shaft carries four unbalanced masses 18kg,14kg,16kg and 12kg at radii 50 mm 60 mm 70 mm and 60mm respectively. The 2^{nd} ,3^{rd} and 4^{th} masses revolve in planes 80 mm ,160mm , and 260 mm respectively from the plane of first mass and are angularly located at 60°,135° and 270° respectively measured clockwise from the first mass looking from the end of the shaft .The shaft is dynamically balanced by two masses two masses both located at 50mm radii and revolving in planes midway between those of 1^{st} and 2^{nd} masses and midway between those of 3^{rd} and 4^{th} masses .Determine the magnitude of their masses and their respective angular position

(Or)

14 (b) A shaft is supported in bearings 1.8 m apart and projects 0.45 m beyond bearings at each end. The shaft carries three pulleys one at each end and one at the middle of its length. The mass of end pulleys is 48 kg and 20 kg and their centre of gravity are 15 mm and 12.5 mm respectively from the shaft axis. The centre pulley has a mass of 56 kg and its centre of gravity is 15 mm from the shaft axis. If the pulleys are arranged so as to give static balance, determine : **1.** relative angular positions of the pulleys, and
2. dynamic forces produced on the bearings when the shaft rotates at 300 r.p.m. (16)

15 (a) (i) A vibrating system is defined by the following parameters:
m=2 kg, k=100 N/m C=3N-sec/m. Determine (i) the damping factor,(ii) the natural frequency of damped vibration (iii)lograrithmic decrement (iv) the ratio of two consecutive amplitudes and (v) the number cycles after which the original amplitude is reduced to 10 percent (10)
(ii)Define magnification factor (iii) Damped vibration (iv) Lograthamic decrement (6)

(Or)

15(b) A mass of 10 kg is suspended from one end of a helical spring, the other end being fixed. The stiffness of the spring is 10 N/mm. The viscous damping causes the amplitude to decrease to one-tenth of the initial value in four complete oscillations. If a periodic force of 150 cos 50 t N is applied at the mass in the vertical direction, find the amplitude of the forced vibrations. What is its value of resonance ? (16)