5E6202

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B.Tech. V Sem. (Main/Back) Exam., 2014
Mechanical Engineering
5ME2A Dynamics of Machines (Common with AE)

Time : 3 Hours

Total Marks : 80
Min. Passing Marks : 24

Instructions to Candidates :
Attempt any five questions selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

UNIT – I

1 (a) Distinguish between 'Governor' and a 'Flywheel' of an engine. (6)

(b) In a porter governor, all four arms are of equal length of 250 mm and are hinged on the spindle axis. Mass of each ball is 2.5 kg and sleeve mass is 25kg. The force of friction at sleeve is 30N. The inclination of arms to spindle axis is 30° and 45° for the lowest and highest position of sleeve. Calculate maximum and minimum speeds and sleeve lift. (10)

OR

1 (a) Discuss stability of a Governor with help of neat sketches and controlling force diagrams. (6)

(b) The Hartnell Governor balls are of 3 kg mass each. The ball radius is 120 mm in the mean position when arms are vertical and the speed is 150 rpm. The lengths of ball arms and sleeve arms are 150 mm and 100 mm respectively. The stiffness of spring is 8N/mm and sleeve movement is 15 mm from mean position on either side. Determine the speeds for highest and lowest position of sleeve. (10)

UNIT – II

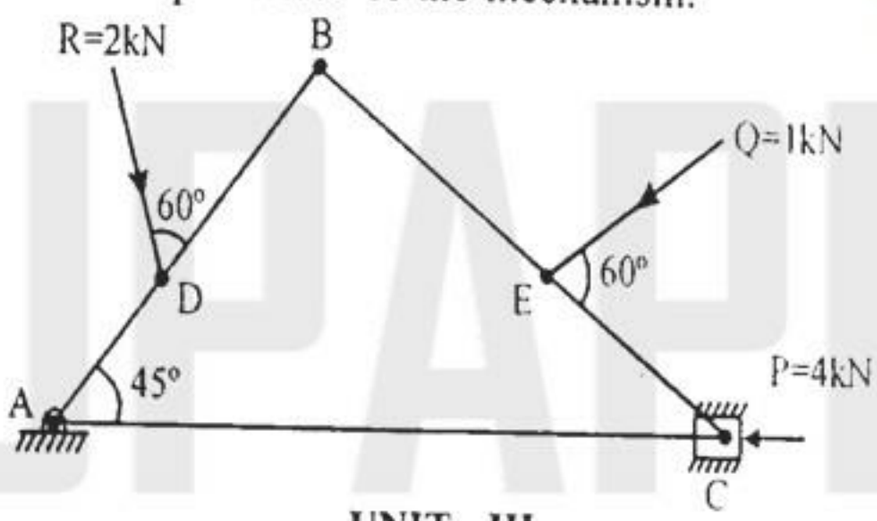
2. (a) Describe gyroscopic effect. Derive an expression for gyroscopic couple. (6)

(b) A racing car of mass 3000 kg has a wheel base 3.0 m and track of 1.5m. The C.G. is located 0.6 m above ground level and 1.5 m from rear axle. Each wheel is of 1 m diameter and 0.8 kg m^2 moment of inertia. Determine load distribution on wheels of car if car is rounding a curve of 80 m radius at a speed of 120 kmph and takes right turn. (10)

OR

2. (a) Draw and explain turning moment diagram of a single cylinder, 4 stroke diesel engine. (6)

(b) A slider crank mechanism is loaded as shown in figure below:
AB = 400mm, BC = 600 mm, AD = 200mm, CE = 300mm
Calculate input torque for the static equilibrium of the mechanism. (10)



UNIT – III

3. (a) Present a comparison of involute and cycloidal tooth profiles. (6)

(b) Derive an expression for minimum no. of teeth on pinion having involute teeth. (10)

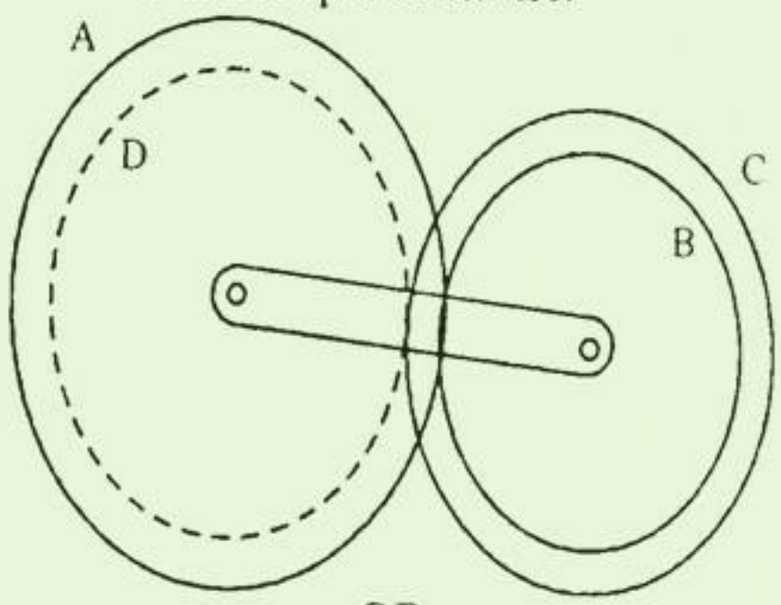
OR

3. (a) Derive an expression for efficiency of Spiral Gear Drive. (6)

(b) Two 20° involute gears in mesh have a gear ratio of 2. The pinion having 20 teeth rotates at 600 rpm. Assuming addendum to be equal to one module, determine:
(i) Path of Contact
(ii) Contact ratio, and
(iii) Maximum velocity of sliding
Given: Module = 5 mm
(10)

UNIT – IV

4. (a) Discuss the speed ratio of a compound gear train.
   (b) In a reverted epicyclic gear train shown in figure, the arm F carries two wheels A and D meshing with compound wheels B and C. All wheels have same module. If no. of teeth $T_A = 80$, $T_C = 72$ and $T_D = 48$. Find the speed and direction of D. Given that wheel A is fixed and F rotates at 240 rpm clockwise. **(10)**



OR

4. (a) Discuss selection of speeds in an automobile gear box. **(6)**
   (b) With help of a neat sketch explain the construction, principle and working of synchromesh Gear box. **(10)**

UNIT – V

5. (a) Explain the concept of 'direct' and 'reverse' cranks in balancing of a radial engine. **(6)**
   (b) A rotating shaft carries four unbalanced masses 20, 15, 18 and 12 kg at radii 50, 60, 70 and 60 mm respectively. The second, third and fourth masses revolve in planes 100, 150 and 300mm respectively measured from the plane of first mass and at angular positions of 60°, 120° and 280° respectively measured clockwise from the first mass. The shaft is dynamically balanced by two masses both located at 50mm radii and revolving in planes midway between those of first and second masses and midway between those of third and fourth masses. Determine magnitudes of balance masses and their angular positions. **(10)**

OR

5. (a) Discuss Hammer blow and variation of tractive effort in a locomotive. **(6)**
   (b) Discuss balancing of V-Engines. Conclude the resultant primary and secondary unbalanced forces for a V-90 engine. (lines of stroke at 90° with each others). **(10)**

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