SV-83

Total No. of Pages : 3

Seat No.	

T.E. (Mechanical Engineering) (Part-III) (Semester - V)
(Revised) Examination, April - 2018
THEORY OF MACHINES - II
Sub. Code : 66242

Day and Date : Wednesday, 25 - 4 - 2018 **Total Marks : 100**
Time : 10.00 a.m. to 1.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labeled sketch wherever necessary.**
4) **Assume if necessary suitable data and state clearly.**
5) **Use of Non programmable calculator is permitted.**

Q1) a) Derive an expression for the centre distance for a pair of spiral gears and define the following terms. **[8]**

i) Normal pitch

ii) Axial pitch

OR

Prove that the condition for maximum efficiency in case of spiral gear is $\alpha = \frac{\theta + \phi}{2}$ where, ϕ = friction angle, θ = shaft angle and α = spiral angle on the driving wheel.

b) Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ration is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find the maximum velocity of sliding. **[10]**

Q2) a) Explain the working of Differential gear of an automobile. **[6]**

OR

Explain the concept of equivalent mass and moment of inertia applied for gear trains.

P.T.O.

b) Fig. 2 b shows an epicyclic gear train. Gear 'A' is fixed to the frame and is therefore stationary. The arm 'B' and gear 'C' and 'D' are free to rotate on the shaft. Gears 'A', 'C' and 'D' have 100, 101 and 99 teeth respectively. Pitch circle diameters of all are the same so that the planet gear 'P' meshes with all of them. Determine the revolutions of gears 'C' and 'D' for a revolution of the arm 'B'. **[10]**

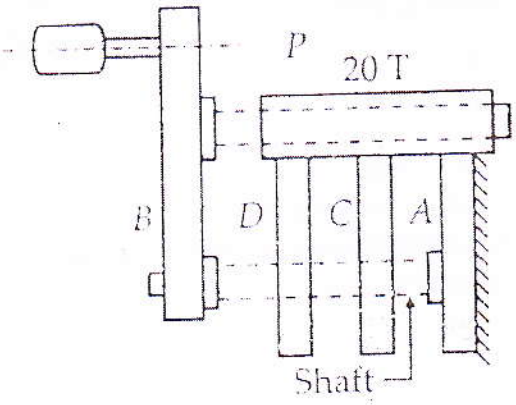

Fig. 2 b.

Q3) a) Derive the expression for gyroscopic couple magnitude. **[6]**

b) A two wheeler of 400 mm wheel radius is negotiating a turn of radius 60 m at speed of 100 km/h. The combined mass of vehicle with its rider is 300 kg. The C.G. of rider is 0.6 m above ground level. The mass moment of inertia of engine flywheel is 0.3 kg-m^2 and moment of inertia of each road wheel is 1 kg-m^2. If the speed of the engine is five time the speed of the wheel and in the same direction, find the angle of heel of vehicle. **[10]**

Q4) a) Derive an expression for velocity and acceleration of the slider of slider crank mechanism. **[6]**

OR

Explain dynamically equivalent system to replace connecting rod by a two mass system.

b) The connecting rod of a vertical reciprocating engine is 2 m long between centres and weights 250 kg. The mass centre is 800 mm from the big end bearing. When suspended as a pendulum from the gudgeon pin axis, it makes 8 complete oscillations in 22 seconds. Calculate the radius of the gyration of the rod about an axis through its mass centre. The crank is 400 mm long and rotates at 200 rpm. Find the inertia torque exerted on the crankshaft when the crank has turned through 40° from the top dead centre and the piston is moving downwards. **[10]**

Q5) a) Explain direct and reverse crank method for balancing of the radial engine.[6]

OR

Explain what is multi cylinder inline engine. Also explain conditions to have primary and secondary forces and couple balancing in multi cylinder in line engine.

b) Four masses A, B, C and D as shown below are to be balanced. **[12]**

	A	B	C	D
Mass (kg)	--	30	50	40
Radius (mm)	180	240	120	150

The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is 90°. B and C makes angles of 210° and 120° respectively with D in the same sense.

Find:

i) The magnitude and the angular position of mass A, and

ii) The positions of planes A and D.

Q6) a) Explain maximum fluctuation of energy and coefficient of fluctuation of energy. **[6]**

b) The turning moment diagram for a multi cylinder engine has been drawn to a scale 1 mm = 600 N-m vertically and 1 mm = 3° horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end, are as follows:

+52, –124, +92, –140, +85, –72 and +107 mm^2, when the engine is running at a speed of 600 rpm. If the total fluctuation of speed ±15% of the mean, find the necessary mass of the flywheel of radius 0.5 m. **[10]**