



Theory of Machine - II (1040)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any two** sub questions from each unit.
5. Figure to the right indicates full marks.
6. Use of non-programmable calculator is allowed.
7. Draw a neat sketch and assume suitable data if necessary.
8. Use drawing sheet wherever required.

UNIT – I

1. a) Describe construction and working of belt transmission dynamometer and Bevis – Gibson torsion dynamometer. **10**
- b) Show that $\frac{T_n}{T_0} = \left[\frac{1 + \mu \tan \theta}{1 - \mu \tan \theta} \right]^n$ for a band and block brake. **10**
- c) Explain in brief : **10**
 - i) Shoe brakes
 - ii) Braking torque
 - iii) Leading and trailing shoes
 - iv) Self locking and self energised brakes.
 - v) Absorption and Transmission dynamometers.

UNIT – II

2. a) What is flywheel? What is its use? Define the terms – **10**
 - i) Coefficient of fluctuation of energy.
 - ii) Coefficient of fluctuation of speed and
 - iii) Turning moment diagram.
- b) What is tangent Cam? Find the expressions for the velocity and Acceleration of a roller follower on the flank for such a Cam. **10**

- c) A machine is coupled to a two stroke engine which produces a torque of $(800+180\sin 3\theta)$ N.m, where θ is the crank angle. The mean engine speed is 400 rpm. The flywheel and the other rotating parts attached to the engine have a mass of 350 kg at a radius of gyration of 220 mm. Calculate –
- power of the engine
 - total fluctuation of speed of the flywheel when the –
 - rotating torque is constant
 - resisting torque is $(800+80\sin\theta)$ N.m.

UNIT – III

3. a) Discuss the effect of friction on the functioning of a porter governor? Derive it, governing equation taking into account the friction at the sleeve. **10**
- b) Discuss Gyroscopic effect on – **10**
- Aeroplane
 - Naval ship
- c) A disc with radius of gyration of 60 mm and a mass of 4 kg is mounted centrally on a horizontal axle of 80 mm length between the bearings. It spins about the axle at 800 rpm counter clockwise when viewed from the right hand side bearing. The axle processes about a axis at 50 rpm in the clockwise direction when viewed from above. Determine the resultant reaction at each bearing due to the mass and gyroscopic effect. **10**

UNIT – IV

4. a) What is gear train? What are its types? **10**
Explain reverted and epicyclic gear train.
- b) Two involute gears in a mesh have a module of 8mm and a pressure angle of 20° . The larger gear has 57 while the pinion has 23 teeth. If the addenda on pinion and gear wheels are equal to one module, find the (i) contact ratio (ii) angle of action of the pinion and the gear wheel (iii) ratio of the sliding to rolling velocity at the (a) beginning of contact (b) pitch point (c) end of contact. **10**
- c) State and explain law of gearing. **10**
Two spur gears have a velocity ratio of $1/3$. The driven gear has 72 teeth of 8mm module and rotates at 300 rpm. Calculate the number of teeth and the speed of the driver. What will be the pitch line velocities?

UNIT – V

5. a) Write short note on – 10
- i) Static and dynamic balancing.
 - ii) Balancing of Rotating masses.
 - iii) Balancing of Reciprocating masses.
- b) Explain the concept of direct and reverse cranks. Also describe 10
balancing of radial of Vee engines.
- c) A four crank engine has the two outer cranks set as 120° to each other and their reciprocating masses are each 4.2 KN. The distance between the planes of rotation of adjacent cranks are 450, 750 and 600 mm. If the engine is to be in complete primary balance, find reciprocating mass and relative angular position for each of the inner cranks.
- If the length of each crank is 300 mm, the length of the connecting rod is 1200 mm and the speed of rotation is 250 rpm. What is the maximum secondary unbalanced force?
