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Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (AE) (2012 to 2017) (Sem.-4)

MECHANICS OF MACHINES

Subject Code : BTAE-402

M.Code : 54123

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A**Write briefly :**

- Q1 What is the difference between structure and machine?
- Q2 What is pressure angle in cam?
- Q3 Differentiate between lower and higher pair.
- Q4 What is rigid body and how is it differing from resistant body?
- Q5 “Slack side of the open belt drive is always on upper side”, why?
- Q6 What is the difference between pitch point and trace point in cam profile?
- Q7 Define the piston effort. List the factors which influence the piston effort.
- Q8 What is dynamically equivalent system?
- Q9 What is swaying couple?
- Q10 Draw free body diagram for Hartnell governor for its extreme positions?

SECTION-B

- Q11 A cast iron flywheel is fitted to a punch press to run at 90 r.p.m and must supply 12000 N-m of energy during $1/5^{\text{th}}$ revolution and allow 15% change of speed. The ring speed is limited to 350 m/min. Find the mean diameter, mass of flywheel and the motor power. Assume overall efficiency as 80%.
- Q12 A casting having a mass of 100 kg is suspended freely from a rope. The rope makes 2 turns round a drum of 300 mm diameter rotating at 24 rpm. The other end of the rope pulled by the man. Calculate :
- Force required by the man
 - Power required to raise the casting and
 - Power supplied by the drum run by prime mover. Take $\mu = 0.3$.
- Q13 A proell governor has equal arms of length 300 mm. The upper and lower end of the arms are pivoted on the axis of the governor. The extension arm of the lower links is each 80mm long and parallel to the axis when the radii of rotation of the balls are 150 mm and 200 mm. The mass of each ball is 10 kg and central load is 100 kg. Determine range of speed of the governor.
- Q14 a. Two sprockets of chain drive system are 550 mm apart from each other. Determine the number of teeth on driven sprocket, pitch and length of the chain if driver sprocket has 20 teeth with 500 mm pitch circle diameter and reduce the speed from 200 rpm to 100 rpm.
- b. Calculate the degree of freedom of linkage given if Fig.1

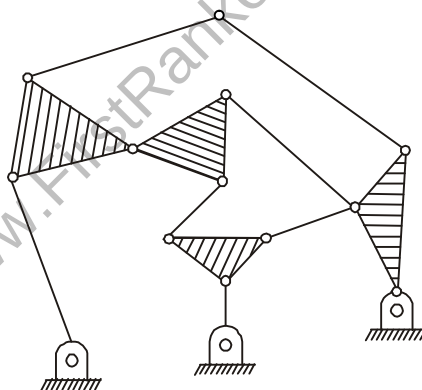


Fig.1

- Q15 a. With suitable diagrams explain the various type of constrained motions.
- b. In a Crank-slotted lever quick return mechanism, the distance between the fixed centers is 80mm and the length of the crank is 20mm. Determine the time ratio of working stroke to the return stroke.

SECTION-C

- Q16 A, B, C and D are four masses carried by a rotating shaft at radii 100 mm, 125 mm, 200 mm and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg and 4 kg respectively. Find the required mass A and relative angular settings of the four masses so that the shaft shall be in complete balance.
- Q17 Draw the profile of the cam operating a knife edge reciprocating follower and with the following data; minimum radius of the cam = 25mm Lift = 30mm. The cam lifts the follower for 120° with simple harmonic motion followed by the dwell period of 30° . Then the follower suddenly falls to its half of lift and lower down during 150° of the cam rotation with uniform velocity followed by the dwell period. Cam rotates with speed of 150 rpm.
- Q18 The dimensions of four bar link mechanism are $AB = 400$ mm, $BC = 600$ mm, $CD = 500$ mm, $AD = 900$ mm and $\angle DAB = 60^\circ$. AD is a fixed link, E is the point on link BC such that $BE = 200$ mm and $CE = 400$ mm. A force P of 150 N acts at 45° at a distance of 250 mm from D, as shown in Fig. 2. Another force Q = 100 N acts at E at an angle of 180° . Find the required input torque on link AB for static equilibrium of the mechanism.

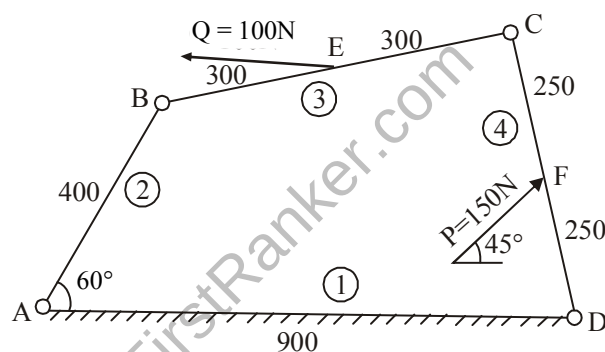


Fig.2

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.