17412

11819

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Answer ***each*** *Section on* ***separate*** *answer sheet.*
(3) Answer ***each*** *next main question on a new page.*
(4) Illustrate your answers with neat sketches ***wherever*** *necessary.*
(5) Figures to the ***right*** *indicate* ***full*** *marks.*
(6) Assume suitable data, if ***necessary****.*
(7) ***Use*** *of non-programmable* ***Electronic Pocket Calculator*** *is permissible.*
(8) Mobile phone, pager and any other Electronic Communication devices are not permissible in ***Examination Hall****.*

Marks

1. A) Attempt **any six** of the following : **(2×6=12)**

a) Define higher pair with one example.

b) Name four types of Kinematic pairs based on relative motion between the link.

c) Define fluctuation of energy and coefficient of fluctuation of energy.

d) Define slip and creep in case of belt drive.

e) Give the reason for providing flywheel in the engine.

f) Explain the concept of balancing.

g) State the advantages of roller follower over knief edge follower.

h) Write the application of following :

i) Single plate clutch

ii) Multi plate clutch.

B) Attempt **any two** of the following : **(2×4=8)**

a) Give the classification of different types of brakes.

b) Distinguish between flywheel and governor.

P.T.O.

Marks

c) Find power transmitted by belt running over a pulley of 60 mm diameter at 200 r.p.m. The coefficient of friction between belt and pulley is 0.25 and angle of Lap is 180^{o}. Take maximum tension in belt equal to 2500 N.

2. Attempt **any four** of the following : **(4×4=16)**

a) Define the following terms in Mechanism.

i) Angular velocity.

ii) Absolute velocity.

iii) Relative velocity.

iv) Angular acceleration.

b) Explain the process of single rotating mass when the balance masses are on the opposite sides of disturbing mass.

c) What do you mean by inversion ? What are the various types of inversions of four bar chain ?

d) Differentiate between structure and machine.

e) Compare cross belt drive and open belt drive on the basis of

i) Velocity ratio.

ii) Direction of driven pulley.

iii) Application.

iv) Length of belt drive.

f) State two types of followers and two types of cams with one application for each. Draw respective sketches.

3. Attempt **any four** of the following : **(4×4=16)**

a) Explain with neat sketch the working of scotch yoke mechanism.

b) Define completely constrained motion and successfully constrained motion with neat sketch. State one example of each.

c) Explain with sketch working principle of epicyclic gear train.

d) Give four advantages of chain drive over belt drive.

e) State and explain the significance of "Turning moment diagram" for four stroke I.C. engine.

f) Describe stepwise procedure for determination of velocity and acceleration by Klein's construction with suitable data.

Marks

4. Attempt **any four** of the following : **(4×4=16)**

a) Define :

i) Centrifugal tension.

ii) Initial tension. State its formulae. State the condition for maximum power transmission.

b) State different types of follower motion. Also draw shapes of typical displacement diagram for each.

c) Explain with neat sketch construction and working of Eddy Current Dynamometer.

d) Justify with neat sketch, Oldham's coupling as an inversion of double slider crank chain.

e) Four masses are 260 kg, 160 kg, 300 kg and 200 kg. The corresponding radii of rotation 300 mm, 250 mm, 150 mm and 200 mm respectively. The angle between successive masses are 0^o, 45^o, 90^o and 135^o. Find the position and magnitude of balancing required, if its radius of rotation is 200 mm by using graphical method.

f) Define the following terms in spur gear terminology :

i) Pitch point.

ii) Circular pitch (Pc).

iii) Clearance.

iv) Backlash.

5. Attempt **any two** of the following : **(2×8=16)**

a) A band and block brake has 12 wooden blocks each subtending an angle of 14^o at the centre of the brake drum of diameter 1.05 m. The blocks are 5 cm thick. The two ends of the bands are attached on the opposite side of the differential brake lever at distances of 8 cm and 2 cm from the fulcrum. The coefficient of friction is 0.35. Find the minimum force required to be applied at the end of the lever 1m long assuming that the drum rotates

i) Clockwise

ii) Anti-clockwise, when a braking torque of 5000 Nm is required.

b) The Crank of reciprocating engine is 40 mm long and it rotates at a uniform speed of 20 rad/s clockwise. The connecting rod is 160 mm. Determine the velocity and acceleration of piston and angular velocity and angular acceleration of connecting rod when the crank is at 45^o from inner dead centre.

c) A multiplate clutch transmit 55 kW of power at 1800 r.p.m. coefficient of friction for frictional surface is 0.1. Axial intensity of pressure is not to exceed 160 kN/mm^2. The internal radius is 80 mm and it is 0.7 times the external radius. Find the number of plates needed to transmit the required torque.

Marks

6. Attempt **any two** of the following : **(2×8=16)**

a) Draw the profile of cam to raise a valve with S.H.M. through 5 cm in 120° of revolution, keep it fully raised through 30° and lower it with equal uniform acceleration and retardation through 90° of rotation. The valve remains closed during the rest of rotation. The diameter of roller is 2 cm and minimum radius of the cam is 5 cm. The axis of valve rod is offset 2 cm from the axis of the shaft. Assume the cam rotating in clockwise direction.

b) Determine the loss of power in a foot step bearing due to friction if a load of 15 kN is supported and the shaft is rotating at 100 r.p.m. The diameter of bearing is 15 cm and coefficient of friction is 0.05. Assume the two conditions :

i) Uniform wear

ii) Uniform pressure.

c) Figure 1 shows a four bar chain mechanism. Crank AB rotates with an angular velocity of 100 rad/s and an angular acceleration of 4000 rad/s^2. When the crank is at 50° to the horizontal. Determine the angular velocity and angular acceleration of the links BC and CD. Assume, AB = 6 cm, BC = 8 cm, CD = 4 cm, AD = 12 cm (fixed).

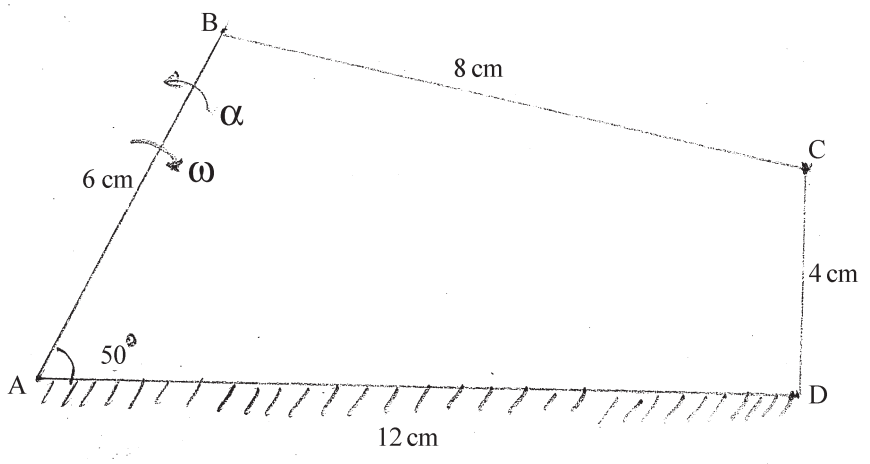

Fig. No. 1