

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER - 2024**

AUTOMOBILE DESIGN

[Maximum Marks: 100]

[Time: 3 Hours]

PART-A

[Maximum Marks: 10]

- I. (Answer *all* questions in one or two sentences. Each question carries 2 marks)
1. Draw the sketch of a coupling wheel of a locomotive.
 2. What are the proportions of a key?
 3. Write down the equation of centrifugal tension in a belt drive.
 4. What are the functions performed by oil control rings?
 5. State any three applications of reverted gear train. (5 x 2 = 10)

PART-B

[Maximum Marks: 30]

- II. (Answer *any five* of the following questions. Each question carries 6 marks)
1. Explain the process of inversion of a mechanism.
 2. Briefly discuss on equivalent twisting and equivalent bending moment.
 3. How does the couplings are classified?
 4. Draw the cross-sectional view of a typical IC engine piston and mark all parts.
 5. Explain uniform pressure theory.
 6. List out the applications of various types of gears used in an automobile.
 7. Compare the displacement diagrams of follower moves with uniform velocity and simple harmonic motion with the aid of proper sketches. (5 x 6 = 30)

PART-C

[Maximum Marks: 60]

(Answer *one* full question from each Unit. Each full question carries 15 marks)

UNIT – I

- III. a. Explain different types of designs. (7)
- b. A solid shaft is transmitting 1MW at 240 r.p.m. Determine the diameter of the shaft if the maximum torque transmitted exceeds the mean torque by 20%. Take the maximum allowable shear stress as 60 MPa. (8)

OR

- IV. a. What is meant by a four-bar chain? (7)
- b. A shaft is supported at ends in a ball bearing carries a central load of 1000 N and is to transmit 8 kW at 100 rpm. The distance between the centres of bearings is 2.8 m. If the allowable tensile stress is 45 N/mm², determine the size of the shaft. (8)

UNIT – II

- V. a. Differentiate between parallel key and woodruff key. (7)
b. A shaft of 50 mm diameter is transmitting 12 kW at 250 r.p.m. A square key having 16 mm side and 75 mm length is used for the shaft. Determine the induced shear stress and crushing stress in the key. (8)

OR

- VI. a. Derive the condition for maximum power transmission through a belt drive. (7)
b. Explain the design procedure of a Muff coupling. (8)

UNIT- III

- VII. a. Explain the working of a single plate clutch with the help of a diagram. (10)
b. List any five design considerations of a piston. (5)

OR

- VIII. a. Determine the maximum and minimum pressure in a single plate clutch when the axial force is 6 kN. The inside radius of the contact surface is 60 mm and the outside radius 120 mm. Assume uniform wear. (8)
b. Describe about design considerations of a friction clutch. (7)

UNIT - IV

- IX. A cam, with a minimum radius of 25 mm, to be designed to give the motion to a roller follower (moves with simple harmonic motion during outstroke and return stroke), at the end of a valve rod, motion described below:
1. To raise the valve through 50 mm during 120° rotation of the cam:
2. To keep the valve fully raised through next 30°.
3. To lower the valve during next 60° and
4. To keep the valve closed during rest of the revolution i.e. 150°
The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam. (15)

OR

- X. a. Explain simple and compound type gear trains. (10)
b. A gear which has 52 teeth has a pitch circle diameter of 400 mm, find the module, diametral pitch and circular pitch. (5)
