

B. PRINTING ENGINEERING EXAMINATION, 2023

(2ND Year, 1ST Semester)

PRINTING MACHINE DESIGN

Time : 3 Hrs.

Full marks :100

(Attempt anyone from (a) and (b) in Question-1.)(marks=10)

- 1a. (i) Describe the general procedure to solve a machine design problem. (4)
- (ii) What is meant by 'Fundamental deviation ? Explained with neat sketch. (6)
- 1b. (i) List the important factors that influence the magnitude of factor of safety. (4)
- (ii) Find the values of allowance, hole tolerance and shaft tolerance for the following dimensions of mating parts according to basic hole system:
- | | |
|-----------------|------------------|
| Hole: 25.00 mm. | Shaft: 24.97 mm. |
| 25.02 mm. | 24.95 mm. |
- (6)

(Attempt any one from (a) and (b) in Question -2.) (marks=10)

- 2a. (i) What are the important terms used in screw threads?
Draw the sketches. (5)
- (ii) Two shafts are connected by means of a flange coupling to transmit torque of **25 N-m**. The flanges of the coupling are fastened by **four bolts** of the same material at a radius of **30 mm**. Find the size of the bolts if the allowable shear stress for the bolt material **30 N/ mm²**. (5)
- 2b. (i) What is meant by a bolt of sizes **M24 X 2** and **M24 X 3** .? (4)
- (ii) What do you understand by **single start** and **double start threads**? (3)
- (iii) Define the terms : **Pitch, Lead**. (3)

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(Attempt two from (a),(b) and (c) in Question -3.) (marks= 2 X10)

- 3a.** Sketch a **protective type flange coupling** and indicate there on its leading dimensions for shaft size of "d". (10)

OR

- (i) What are the **requirement of a good shaft coupling?** (4)
- (ii) Indicate what type of coupling is used under the following conditions:
- (A) with shafts having **collinear axes**,
- (B) shafts having **parallel axis** with a small distance apart.
- (C) shaft having **intersecting axis**. (6)

- 3b.** Discuss the procedure used in designing a cast iron pulley with a neat sketch. (10)

OR

Discuss the different types of pulleys used in **flat belt drives**.

- 3c.** (i) What is a **key** ? state its **function**. (4)
- (ii) How are the keys **classified** ? (6)
- (ii) Draw neat sketche of **Gib-head key** with its design parameters. (5)

(Attempt two from (a),(b) and (c) in Question -4.) (marks=2 X10)

- 4a.** (i) what are the **different types of chains?** Explain with neat sketches, the power transmission chains. (6)
- (ii) Establish the relation : $p = D \cdot \sin(180^\circ/T)$, Where p =pitch of the chain and D = pitch circle diameter of the sprocket. (4)

4b. obtain an expression for the length of a belt in open belt drives. (10)

4c. (i) Explain the terms with neat sketch :
 (A) Circular pitch (B) tooth thickness
 (C) pressure angle (D) module (6)

(ii) In two meshing spur gears as shown in **FIGURE-1**. Calculate useful component force and separating component of force. (4)

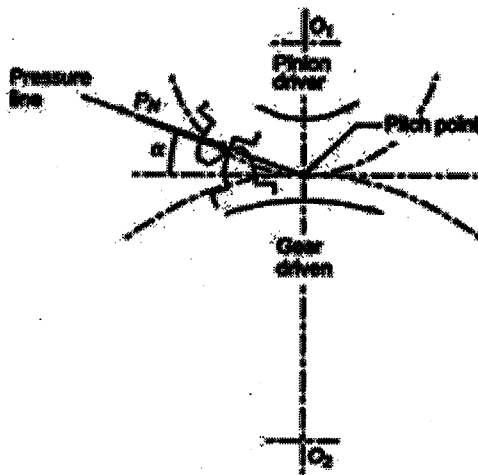


FIGURE-1.

(Attempt three from (a),(b),(c) and (d) in Question -5.) (marks =3 X10)

5a. A pair of spur gears consists of a 20T pinion meshing with a 120T gear.
 The module is 4mm.

Calculate :

- (A) the centre distance; (B) the pitch circle diameters of pinion and gear;
- (C) the addendum and dedendum;
- (D) the tooth thickness;
- (E) the bottom clearance;
- (F) the gear ratio. (10)

5b, The centre –to centre distance between the two sprockets of a chain drive is **600mm**. The chain drive is used to reduce the speed from **180 rpm**. to **90 rpm**. on the driving sprocket has **18T** and a pitch circle diameter **ϕ480mm**.

Calculate : (i) Number of teeth on the driven sprocket;

(ii) Pitch and the length of the chain. (10)

5c. (i) What are the four main parts of a Ball Bearing? Give the sketch. (4)

(ii) In a particular application, the radial load acting on a ball bearing is **5 kN** and expected life for **90%** of the bearing is **8000 hrs**. Calculate the **dynamic load carrying capacity** of the bearing, when the shaft rotates at **1450 rpm**. (6)

5d. (i) What is reverted gear train ? How the **velocity ratio** of this train is obtained. (4)

(ii) The gearing of a machine tool is shown in **FIGURE -2**. The motor shaft is connected to gear **A** and rotates **1050 rpm**. The gear wheels **B,C, D** and **E** are fixed to parallel shafts rotating together. The final gear **F** is fixed on the output shaft. What is the speed of gear **F**? The number of teeth on each gear are as given below :

Gear	:	A	B	C	D	E	F
Number of teeth	:	40	100	50	150	52	130

(6)

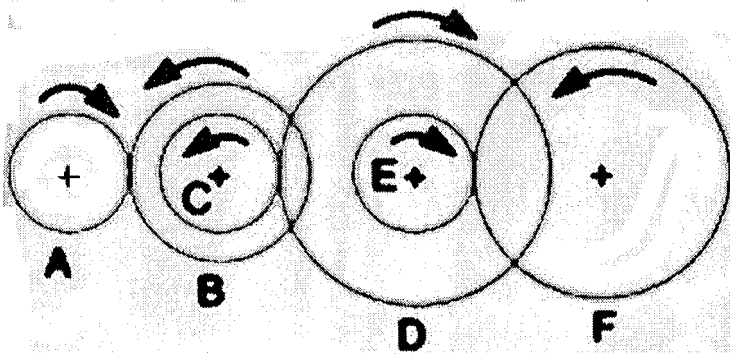


FIGURE - 2

(Attempt any one from (a) and (b) in Question -6.) (marks= 10)

6a. (i) Name the various rollers used in inking system of a OFF-SET printing machines and mention their dimensions, types of covering use. (5)

(ii) Find the diameter of a solid shaft to transmit 15HP. At 200 rpm. The ultimate Shear stress(τ_u) for the steel may taken as 360N/mm^2 and a factor of safety as 8. (5)

6b. (i) Define the terms:

(A) load; (B) stress; (4)

(ii) A mild steel rod of $\phi 12\text{mm}$ was tested for tensile strength with gauge length of 50mm. Following observations was recorded: Final length = 80mm; Final diameter = $\phi 7\text{mm}$; Yield load = 3.4kN. and Ultimate load = 6.1kN.

Calculate: 1. Yield stress(σ_y), 2. Ultimate tensile stress(σ_{ut}),
3. % reduction in area, 4. % elongation. (6)