EX/PRN/PC/B/T/212/2024

B. PRINTING ENGINEERING EXAMINATION, 2024

(2ND Year, 1ST Semester)

PRINTING MACHINE DESIGN

Time : 3hrs. **(Attempt any five questions)** **Full marks : 100.**

(Attempt any one from (a) and (b) in Question No. 1.)

1a. **(i)** What do you mean by **factor of safety** ? **(4)**

(ii) **List** the **important factors** that influence the magnitude **factor of safety**. **(8)**

(iii) A mild steel rod of **ϕ15mm** was tested for tensile strength with with gauge length of **55mm.** Following observations was recorded: **Final length = 85 mm; Final diameter =ϕ7.5 mm; Yield load =3.5kN. and Ultimate load= 6.5kN.**

Calculate: 1. **Yield stress**(σy), 2. **Ultimate tensile stress(σut),**

3. **% reduction in area,** 4. **% elongation.** **(8)**

1b. (i) **Define the terms: Load, stress and strain.** **(8)**

(ii) **Discuss** the **various types** of **stresses** with **neat sketches.** **(12)**

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

2a. **(i)** What are the **important terms** used in **screw threads**? **Explain** with **neat sketch.** **(12)**

[Turn over

(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 core diameter of the bolts** if the allowable shear stress for the bolt material **30 N/ mm².**

(8)

2b. (i) Write the name of various forms of **screw threads.** **Explain** with **neat sketches** and **standard design parameters.** **(12)**

(ii) What are the **advantages** and **disadvantages** of **screwed joints?** **(4)**

(iii) What is **meant** by a bolt of **sizes M30 X 3.0 and M30 X 3.5 ?** **(4)**

(Attempt anyone from (a) and (b) in Question-3.)

3a. (i) **Define** the following: **(I) tolerance; (II) allowance; (III) interchangeability; (IV) unilateral and bilateral system of tolerance.** **(12)**

(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.** **(8)**

3b. (i) what do you understand by the **nominal size, basic size** and **actual size**? Explain with sketch. **(8)**

(ii) What are the various types of **fits** according to **Indian standard**? Explain these with the help of **neat sketches.**

(12)

(Attempt any one from (a), (b) and (c) in Question No. 4.)

4a. (i) Discuss briefly the various types of **belt used for the power** transmission with **neat sketches.** **(10)**

(ii) obtain an **expression** for the length of a belt in **open belt drive**. Also determine the **angle of contact** any one of them. **(10)**

4b. (i) **Discuss** the **different types of pulleys** used in **flat belt drives.** **(10)**

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

OR

(iii) Two pulleys. One **ϕ450 mm** diameter and the other **ϕ200 mm** diameter, on parallel shafts **1.95 m** apart are connected by a crossed belt. Find the **length of the belt** required and the **angle of contact** between the belt and each pulley.
Also **calculate** the **power transmitted** by the belt when the large pulley rotates at **200 r.p.m**. If the maximum permissible tension in the belt is **1000 N**, and the coefficient of friction between the belt and pulley is **0.25**.

(10)

(Attempt any one from (a) and (b) in Question No. 5.)

5a. (i) what are the different types of chains? **Explain with neat sketches,** the **power transmission of chain.** **(10)**

(ii) **Obtain an expression** for the **length of a chain.** **(10)**

5b. (i) What do you understand by **simplex, Duplex and triplex chains?** **(10)**

(ii) **(A)** In chain drives find the relation between:
Chain speed(v) and angular velocity(ω) of sprocket; **(5)**

(B) Establish the relation : **$p = D.\sin(180°/T)$,** Where p=pitch of the chain and D= pitch circle diameter of the sprocket. T = No of teeth. **(5)**

OR

(iii) A chain drive is used for speed reduction from **180rpm.** to **90rpm.** The number of teeth on the driving sprocket is **18T.** The centre to centre distance between two sprocket is **600 mm** and the pitch circle diameter of the driving sprocket is **ϕ480 mm.**
Determine: **(A) number of teeth on the driven sprocket,**
(B) pitch of the chain,
(C) length of the chain.
(10)

(Attempt any one from (a) and (b) in Question No. 6.)

6a. **(i)** What is a Bearing? How will you classify the Bearings ? **(6)**

(ii) What are the **four main parts** of a **Ball Bearing?** **(4)**

(iii) In a particular application, the radial load acting on a ball bearing is **5 kN** and the expected life for **90%** of the bearing is **10000 hr. Calculate the dynamic load carrying capacity** of the bearing, when the shaft rotates at **1450 rpm.** **(10)**

6b. (i) How the shaft is designed when it is subjected to combined twisting and bending moment only ?

(10)

(ii) A line shaft is driven by means of a motor placed vertically below it. The pulley on the line shaft is **ϕ1500 mm** and has belt tension **5.4 kN** and **1.8 kN** on the tight and slack side of the belt respectively. Both these tension may be assumed to be vertical. If the pulley be overhang from the shaft, the distance of the centre line of the pulley from the centre line of the bearing being **400 mm**. Draw the **space diagrams** of these setup (Front and side views) and **design the shaft.**
Given : Maximum allowable shear stress (τ)= **42 N/mm²**

(10)

OR

(iii) Name the various **rollers** used in **inking** system of a **OFF-SET printing machines** and mention their **dimensions,** types of **covering** use. **(10)**

(Attempt any one from (a) and (b) in Question No. 7.)

7a. **(i) Explain** the terms with **neat sketch** :

(A) Circular pitch **(B) base circle**

(C) pressure angle **(D) module** **(10)**

(ii) What **condition** must be satisfied in order that a **pair of spur gears** may have a **constant velocity ratio(Law of gearing)** ? **(10)**

7b. (i) What do you understand by **'gear train'**? **Discuss** the **various type** of **gear trains** with **neat sketches.** How the **velocity ratio** of this train is obtained. **(12)**

(ii) The gearing of a machine tool is shown in **FIGURE -1**. The motor shaft is connected to gear **A** and rotates **975 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	: 20	50	25	75	26	65

(8)

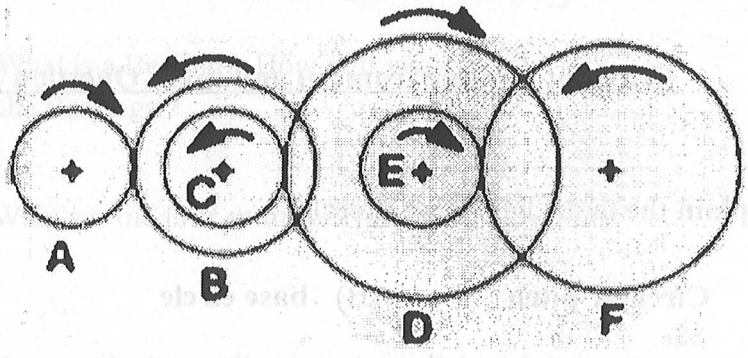

FIGURE -1.