B. Printing Engineering Examination, 2018

(2ⁿᵈ Year, 2ⁿᵈ Semester)

PRINTING MACHINE DESIGN

<u>Time :3 hrs.</u>   <u>Full marks : 100.</u>

<u>Attempt any one from (a)and (b)in Question-1.</u>

1. (a)   (i) What do you **understand** by the nominal size and basic size?   (2)

(ii)What are the various **types** of fits according to Indian Standard? **Explain** these,with the help of neat sketches.   (8)

   (b)   (i) According to Indian Standard Specification what do you mean by **100 H 8 / g5**.   (2)

(ii) **Calculate** the tolerance, fundamental deviations and limits of sizes for the shaft Designation as **40 H8 / f7**. Given : $i = 0.45^3\sqrt{D} + 0.001D$ microns and steps diameter **30mm to 50mm** and fundamental deviation(upper deviation) for shaft '**f**' is $es = -5.5(D)^{0.41}$.   (8)

2. (a)   (i) **Define** the following terms :   **major diameter; minor diameter;   pitch; lead**.   (6)

(ii)**Derive** an expression for the maximum load in a bolt when a bracket with circular base is bolted to a wall by means of four bolts.   (8)

(iii)A flanged bearing as shown in **<u>FIGURE-1</u>**, is fastened to a frame by means of **four bolts** spaced equally on ϕ500mm bolt circle. The diameter of flange is ϕ650mm and a load of **400kN** acts at a distance of **250mm** from the frame. Take safe tensile stress $\sigma t = 60N/mm^2$ for the material of the bolts. **Determine the size of the bolts.**   (6)

<u>Attempt any two from (a), (b) and (c) in Question-3.</u>

3. (a)   **Discuss** the **different types** of pulleys used in flat belt drives with neat **sketches**.   (10)

(b)   **Discuss** the procedure used in designing a cast iron pulley.   (1C

(c)   (i) **Indicate** what type of coupling is used under the following conditions: 5.
            (A) with shafts having **collinear axis;**

            (B) shafts having **intersecting axis;**

            (C) shafts having parallel axis with a **small distance aparts.**   (1X3

       (ii)**Sketch** a Protective type **Flange Coupling** and indicate there on its **leading dimensions**
       for **shafts size of 'd'.**   (7

Attempt any one from (a), (b) and (c) in Question-4.

1. (a)   A pulley transmits **35kW at 240 r.p.m.** The belt drive is vertical and the angle of wrap
           may be taken as **180°.** The distance of the pulley centre line from the nearest bearing
           is **350mm,** co-efficient of friction(μ) = **0.25,** No. of arms**(n) = 6,** assuming the section
           Of the arm may be taken as **elliptical,** the major axis being **twice** the minor axis.
           The following stresses may be taken for **design purpose:**
           Shaft – tension and compression :   80 N/mm²;
           Key - shear   : 50 N/mm²;
           Belt - tension   : 2.5 N/mm²;
           Pulley rim -   . : 4.5 N/mm²;
           Pulley arms -   : 15 N/mm².
           Design the following : (i) **diameter of the pulley;**   (ii) **width of the Belt(** assuming
           Thickness of 10mm);   (iii) **diameter of the shaft;** (iv) **size of the arms.**   (20)

    (b)   (i) **Explain** with the help of a neat **sketch,** the construction of **roller chain.**   (10;

           (ii) Write the **design procedure** for a **chain drive.**   (10)

    (c)   (i) What are the various forces acting on spur gears, **explain** with **neat sketch.**   (7)

           (ii) Why tangential component of gear tooth force **is called** ' useful component'?   (3)

           (iii)**Discuss** the design procedure of spur gears.   (10)

5. (a) The following particulars of a single reduction spur gear are given: **Gear ratio = 10:1;** Distance between centres = **660mm** approximately; Pinion transmits **500kW at 1800 r.p.m.;** Involute teeth of standard proportions(addendum=m) with pressure angle between teeth = **175N per mm of width.** Find :

   (i)the nearest standard **module** if no interference is to occure;

   (ii)the number of **teeth** on each wheel;

   (iii)the necessary **width** of the pinion;

   (iv)**the load** on the bearings of the wheels due to power transmitted.   (20)

   (b) The dimensions of a pair of Bevel gears are shown in **FIGURE-2,** the gear 'G' delivers

   5kW power at **500 r.p.m.,** to the output shaft. The **bearings A and B** are mounted on

   The output shaft in such a way that the **bearing B** can take radial as well as thrust load,

   While the **bearing A** can take only radial load and **pressure angle(ϕ) = 20⁰.**

   Determine: (i) **components of tooth force on pinion;** (ii) **components of tooth force**

   on gear; (iii) **draw a space free-body-diagram of this drive;** (iv) **reactions at bearings**

   A and B.   (20)

   (c) (i) Name the **various types** of **ball and roller bearings.** What are the **applications** of these

   bearings?   (6)

   (ii)what is L_{10} life and $L_{10}h$ life of a bearing? Find their **relation.**   (4)

   (iii)A single-row deep groove ball bearing is subjected to a pure radial force of **3kN** from a shaft that rotates at **600 r.p.m.** The **expected life** of the bearing is **30,000 hrs.** The minimum acceptable diameter of the shaft is ϕ**40mm. Select** a suitable ball bearing for this **application.**
   Given: six different bearings are available for the shaft diameter ϕ40mm are : **61808, 16008, 6008, 6208, 6308** and **6408** for dynamic loads **4160N, 13300N, 16800N, 30700N,**

41000N and 63700N.

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

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

(b)A hollow circular **cylinder** is to transmit **5.65kW power** at **80 r.p.m.** If the shear stress Is not to exceed **60N/mm²** and internal diameter is **0.6 times** of the external diameter, Find the **internal and external diameters** of the **cylinder.** Assume that the maximum Torque is **1.4 times** the mean torque.   (10)

FIGURE- 1.

FIFGURE -2.