Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_

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**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **14FP2024** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MECHANICAL SYSTEMS FOR FOOD PROCESSING** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** | |
| 1. |  | The outer and inner diameters of a centrifugal pump are 64 cm and 32 cm respectively. The pump runs at 1200 rpm and works against a total head of 70 m. The velocity of flow through the impeller is constant and equal to 3 m/s. The vanes are set back at an angle 30° at the outlet. If the width of the impeller at outlet is 6 cm, determine (a) Vane angle atinlet, (b) Work done by the impeller/s, and (c) Manometric efficiency. | CO1 & CO3 | 20 | |
| **(OR)** | | | | | |
| 2. |  | Describe the construction, working, advantages and applications of Vane pump. | CO1 | 20 | |
|  |  |  |  |  | |
| 3. | a. | Determine the diameter of a solid shaft which will transmit 90 kW at 160 rpm if the shear stress in the shaft is limited to 60 N/mm2. Find also the length of the shaft, if the twist must not exceed 1 degree over the entire length. Take C = 8 x 104 N/mm2. | CO2 & CO3 | 15 | |
| b. | Explain the design of chain drives used in power transmission. | CO2 | 5 | |
| **(OR)** | | | | | |
| 4. | a. | Compare flexible with rigid coupling used in mechanical systems. | CO2 | 5 | |
| b. | Draw a neat sketch of universal coupling showing the various pins and joints. Also write short notes on coupling. | 15 | |
|  |  |  |  |  | |
| 5. | a. | In a flat belt drive the initial tension is 2000 N. The coefficient of friction between the belt and the pulley is 0.3 and the angle of lap on the smaller pulley is 150°. The smaller pulley has a radius of 200 mm and rotates at 500 r.p.m. Find the power in kW transmitted by the belt. | CO2 & CO3 | 10 | |
| b. | Give the design and working of Fast and loose pulley drive with a neat diagram. | CO2 | 10 | |
| **(OR)** | | | | | |
| 6. | a. | Define and describe the working of the following boiler elements with a neat diagram.  (i) Fusible Plug. | CO2 | 10 | |
| b. | (ii) Economiser. | 10 | |
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| 7. | a. | Write in detail the description, operation and application of the following techniques in food industries.  Cryogenic Freezing. | CO2 | 10 | |
| b. | Blast Freezing. | 10 | |
| **(OR)** | | | | | |
| 8. |  | A refrigerator using NH3 works between the temperatures - 100°C and 250°C. The gas is dry at the end of compression and there is no undercooling of liquid. Calculate the theoretical C.O.P. of the cycle. The properties of NH3 are given below:   |  |  |  |  | | --- | --- | --- | --- | | Temperature  (0C) | Liquid heat (hf)  (kJ/kg) | Liquid heat (hfg)  (kJ/kg) | Liquid entropy(sf)  (kJ/kg) | | 25  -10 | 298.9  135.37 | 1166.94  1297.8 | 1.1242  0.5443 | | CO2 & CO3 | 20 |
|  | | **Compulsory:** |  |  |
| 9. |  | Evaluate the applications of various types of material handling equipments in various aspects of food processing industries. | CO2 | 20 |