**18ME603**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **June, 2022** | **Mechanical Engineering** | | |
| **Sixth Semester** | **Design of Machine Elements-II** | | |
| **Time:** Three Hours | | **Maximum: 5**0 Marks | |
| *Answer Question No. 1 Compulsorily.* | | | (10X1 = 10 Marks) |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | (4X10=40 Marks) |

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| 1. | a) | Mention the applications of power screws. |  |
|  | b) | Distinguish closed and open coiled helical spring. |  |
|  | c) | What is the importance of A.M. Wahl’s factor in the design of helical springs? |  |
|  | d) | What is static load carrying capacity of a bearing? |  |
|  | e) | Define bearing characteristic number. |  |
|  | f) | Why slip is less in case of V-belts when compared with flat belts? |  |
|  | g) | List the factors to be considered during the selection of a belt drive. |  |
|  | h) | Mention the two theories applied to friction plates in the design of a clutch? |  |
|  | i) | Define coefficient of fluctuation of speed and coefficient of steadiness. |  |
|  | j) | Define diametral pitch and addendum of a gear. |  |
|  |  | **Unit-I** |  |
| 2. | a) | Explain different types of threads used for power screws. Give the advantages of square threads. | **4M** |
|  | b) | A double-threaded power screw, with ISO metric trapezoidal threads (θ = 150) is used to raise a load of 300 kN. The nominal diameter is 100 mm and the pitch is 12 mm. The coefficient of friction at the screw threads is 0.15. Neglecting collar friction, calculate (i) torque required to raise the load (ii) torque required to lower the load and (iii) efficiency of the screw. | **6M** |
|  |  | **(OR)** |  |
| 3. |  | A helical compression spring made of oil tempered carbon steel is subjectedto a load which varies from 400 N to 1000 N. The spring index is 6 and the design factor of safety is1.25. If the yield stress in shear is 770 MPa and endurance stress in shear is 350 MPa, find: (i) Sizeof the spring wire, (ii) Diameters of the spring, (iii) Number of turns of the spring, and (iv) Free length ofthe spring. The compression of the spring at the maximum load is 30 mm. The modulus of rigidity for thespring material may be taken as 80 kN/mm. | **10M** |
|  |  | **Unit-II** |  |
| 4. |  | Design a journal bearing for a centrifugal pump from the following data: Load on the journal = 20000 N, Speed of the journal = 900 rpm, Type of oil is SAE l0, for which the absolute viscosity at 55°C = 0.017 kg/m-s, Ambient temperature of oil = 15.50C, Maximum bearing pressure for the pump = 1.5 N/mm2. Calculate also mass of the lubricating oil required for artificial cooling, if the rise of temperature of oil be limited to l0oC and heat dissipation co-efficient is 1232 W/m2/0C. | **10M** |
|  |  | **(OR)** |  |
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| 5. | a) | Enumerate the advantages and disadvantages of rolling contact bearings. | **4M** |
|  | b) | A bearing is required to carry 4.5 kN stationary radial load. The shaft rotates at 1000 rpm and the life desired is 3000 hrs. The running conditions are steady, no shock loading. Select a suitable rolling contact bearing. | **6M** |
|  |  | **Unit-III** |  |
| 6. | a) | State the advantages and disadvantages of V-belt drive over flat belt drive. | **4M** |
|  | b) | Design a rubber belt to drive a dynamo generating 20 kW at 2250 rpm and fitted with a pulley 200 mm diameter. Assume dynamo efficiency to be 85%. Take Allowable stress for belt = 2.1 MPa; Density of rubber = 1000 kg/m3; Angle of contact for dynamo pulley = 165° and coefficient of friction between belt and pulley = 0.3. | **6M** |
|  |  | **(OR)** |  |
| 7. | a) | What are the factors to be considered in the design of brakes? Explain. | **4M** |
|  | b) | A multidisc clutch consists of two steel disks with one bronze disk. The inner and outer diameters of the contacting surfaces are 200 and 250 mm respectively. The coefficient of friction is 0.1 and max pressure between contacting surfaces is limited to 0.4 N/mm2. Assume uniform wear theory, calculate the force required to engage the clutch and the power transmitting capacity at 720 rpm. | **6M** |
|  |  | **Unit-IV** |  |
| 8. |  | A turning moment diagram of a multi-cylinder engine is drawn with a scale of (1mm = 2ᵒ) on abscissa and (1mm = 1250 N-m) on ordinate. The intercepted areas between the torque developed by the engine and the mean resisting torque of the machine taken in order from one end are –30, +400, ‒270, +330, ‒310, +230, ‒380, +270 and ‒240 mm2. The engine is running at a mean speed of 240 rpm and the coefficient of speed fluctuations is limited to 0.02. A rimmed flywheel made of grey cast iron FG200 (mass density = 7100 kg/m3) is provided. The rim contributes 90% of the required moment of inertia. The rim has rectangular cross-section with width to thickness ratio is 1.5. Determine the dimensions of the rim. | **10M** |
|  |  | **(OR)** |  |
| 9. | a) | What are the advantages of helical gears over spur gears? | **3M** |
|  | b) | A pair of spur gears with 20° full-depth involute teeth consists of a 19 teeth pinion meshing with a 40 teeth gear. The pinion is mounted on a crankshaft of 7.5 kW single cylinder diesel engine running at 1500 rpm. The driven shaft is connected to a two-stage compressor. Assume the service factor as 1.5. The pinion as well as the gear is made of steel 40C8 (Sut = 600 N/mm2). The module and face width of the gears are 4 and 40 mm respectively. Using the velocity factor to account for the dynamic load, determine the factor of safety. | **7M** |

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