

Code: 4G565

III B.Tech. II Semester Supplementary Examinations July/August 2021

**Design of Machine Elements-II**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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Marks	CO	Blooms Level
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**UNIT-I**

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|---|-----|-----|----|
| 1. a) What are the advantages and disadvantages of hydrostatic bearings over hydrodynamic bearings.   | 4M  | CO1 | L1 |
| b) The following data is given for a 360° hydrodynamic bearing: Journal diameter =100 mm, bearing length =100 mm, radial load = 50 kN, journal speed = 1440rpm, radial clearance =0.12 mm, viscosity of lubricant =16 Cp. Determine (i) Minimum film thickness (ii) Coefficient of friction and (iii) Power lost in friction. | 10M | CO1 | L5 |

**OR**

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|---|-----|-----|----|
| 2. Estimate the design of a Journal bearing for a centrifugal pump from the following data : Load on the journal = 20000 N, speed of the journal=900rpm, type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg/m-s, ambient temperature of oil = 15.5°C, Maximum bearing pressure for the pump=1.5 N/mm². Calculate also the mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Heat dissipation coefficient = 1232 W/m²/°C. | 14M | CO1 | L6 |
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**UNIT-II**

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|---|-----|-----|----|
| 3. a) Explain briefly about Static and Dynamic load rating of rolling contact bearings.   | 4M  | CO2 | L2 |
| b) A system involves four identical ball bearings, each subjected to a radial load of 2500 N. The reliability of the system i.e., one out of four bearings failing during the lifetime of five million revolutions, is 82 %. Determine the dynamic load carrying of the bearing, so as to select it from the manufacturer's catalogue based on 90% reliability. | 10M | CO2 | L5 |

**OR**

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|---|-----|-----|----|
| 4. a) What are rolling contact bearings? Discuss their advantages over sliding contact bearings.  | 4M  | CO2 | L1 |
| b) Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 rpm for an average life of 5 years at 10 hours per day. Assume uniform and steady load. | 10M | CO2 | L5 |

**UNIT-III**

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| 5. Estimate the design of a Connecting rod for a petrol engine from the following data : Diameter of the piston = 120 mm, Weight of the reciprocating parts=2.0kg, Length of the connecting rod=300 mm, stroke length=140mm, speed=2000rpm, Maximum explosion pressure=2.25N/mm². | 14M | CO3 | L6 |
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**OR**

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|---|-----|-----|----|
| 6. Describe the design procedure for the Piston of an I.C.Engine. | 14M | CO3 | L2 |
|---|-----|-----|----|

UNIT-IV
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|----|----|--|-----|-----|----|
| 7. | a) | Explain the construction of Multileaf Springs.   | 4M  | CO4 | L2 |
|    | b) | A railway wagon of mass 20 tonnes is moving with a velocity of 2 m/s. It is brought to rest by two buffers with springs of 300 mm diameter. The maximum deflection of springs is 250 mm. The allowable shear stress in the spring material is 600 MPa. Estimate the design of the springs for the buffers. | 10M | CO4 | L6 |

OR

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|----|----|---|-----|-----|----|
| 8. | a) | What are the advantages of Flat belt drives?  | 4M  | CO4 | L1 |
|    | b) | A flat belt is required to transmit 30 kW from a pulley of 1.5 m effective diameter running at 300 rpm. The angle of contact is spread over $11/24$ of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.5 mm, density of its material is $1100 \text{ kg/m}^3$ and the related permissible working stress is 2.5 MPa. | 10M | CO4 | L5 |

UNIT-V
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| 9. | a) | What are the applications and advantages of Spur gears?   | 4M  | CO5 | L1 |
|    | b) | The pitch circle diameters of the pinion and gear are 100 mm and 300 mm respectively. The pinion is made of plain carbon steel 40C8 ( $S_u = 600 \text{ N/mm}^2$ ) while the gear is made of grey Cast Iron FG 300 ( $S_{ut} = 300 \text{ N/mm}^2$ ). The pinion receives 5 kW power at 500 rpm through its shaft. The service factor and the factor of safety can be taken as 1.5 each. The face width of the gear can be taken as 10 times that of the module. Assume that the velocity factor accounts for the dynamic load. Determine (i) module and (ii) the number of teeth on the pinion and the gear. | 10M | CO5 | L5 |

OR

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|-----|----|---|----|-----|----|
| 10. | a) | What are the advantages of Helical gears?                       | 7M | CO5 | L1 |
|     | b) | Briefly discuss about the gear tooth failure and their remedies | 7M | CO5 | L5 |

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