

School of Aeronautics (Neemrana)

I-04, RIICO Industrial Area, Neemrana, Dist. Alwar, Rajasthan

Approved by Director General of Civil Aviation, Govt. of India, All India Council for Technical Education
Ministry of HRD, Govt of India & Affiliated to Rajasthan Technical University, Kota & BTU, Bikaner Rajasthan

Question Paper For Internal Assessment Examination (Theory) - Credit 2 / 20

Instructions For Students / Faculty Mid Term I (Total 40 Marks, 1.5 HRS. Syllabus From Beginning Of Session)

• Part A: Total number of questions to be given are four, each carrying 2 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For Both Question & Answer**), no objective type or fill in the blanks. Total 8 marks.

• Part B: Total number of questions to be given are five, out of which student has to answer any three. They are long answer type (**Not More Than 50 Words For Question Only**), each carrying 6 marks. Total 18 marks.

• Part C: Total number of questions to be given are three, out of which student has to answer any two. They are numerical answer type / fully elaborative type* (**Not More Than 70 Words For Question Only**), each carrying 7 marks. Total 14 marks.

Mid Term II & III (Total 60 Marks, 2 HRS. Syllabus From Beginning Of Session)

• Part A: Total number of questions to be given are ten, each carrying 2 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For Both Question & Answer**), no objective type or fill in the blanks. Total 20 marks.

• Part B: Total number of questions to be given are six, out of which student has to answer any four. They are long answer type (**Not More Than 50 Words For Question Only**), each carrying 5 marks. Total 20 marks.

• Part C: Total number of questions to be given are three, out of which student has to answer any two. They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question Only**)*, each carrying 10 marks. Total 20 marks.

* **LIST OF ELABORATIVE THEORY QUESTION SUBJECTS:** 1 FY1 - 04 Communication Skills (Cr 2), 1 FY1 - 05 Human Values (Cr 2), 2 FY1 - 04 Communication Skills (Cr 2), 2 FY1 - 05 Human Values (Cr 2), 3 AN1 - 02 Technical Communication (Cr 2), 4 MH1 - 02 Technical Communications (Cr 2), 4 MH1 - 03 Economics and Financial Accounting (Cr 2), 5 AN5 - 12 Aircraft Maintenance Practices (Cr 2), 6 AN3 - 01 Mechanics of Composite Materials (Cr 2), 6 AN5 - 12 Aircraft Rules and Regulation (Cr 2), 6 MH3 - 01 Automobile Engineering (Cr 2).

FACULTY MEMBERS, PLEASE ENSURE EXCEPT ABOVE LISTED SUBJECTS, NO THEORITICAL ELABORATIVE QUESTION SHOULD BE GIVEN IN PART 'C' OF QUESTION PAPER.

STUDENT IS ALLOWED TO ENTER LATE NOT MORE THAN 15 MIN AFTER STARTING OF EXAM, AND MAY LEAVE THE EXAM HALL ON EXPIRY OF ATLEAST OF 1 Hr FROM THE STARTING TIME OF EXAMINATION.

Question Paper & Student Details

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| Mid Term | Mid Term 2 | Date of Submission | 19/08/2020 |
| Name of Faculty | Mr. Ashok Bhatia | Date of Examination | 24/08/2020 |
| Course | B.Tech (Mechatronics Engineering) | Semester | SEMESTER : 5 |
| Batch | Fourth (4) | Subject | 5 MH3 - 01 Design of Machine Elements (Cr 2) |


COURSE OUTCOMES FOR REFERENCE TO FRAME QUESTION PAPER

(Faculties are required to mention relevant Course Outcome number against the respective question in QP)

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| Course Outcome | 5MH3 - 01 Design of Machine Elements (credit-2) COURSE OBJECTIVE 1.To understand the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components and their applications in real life. 2.To illustrate to students the variety of mechanical components available and emphasize the need to continue learning. 3.To impart the knowledge of design theory to identify and quantify machine elements in the design of commonly used mechanical systems. COURSE OUTCOME 1. Able to apply the fundamentals of stress analysis, theories of failure and material science in the design of machine components, perform correct analysis while drawing upon various mechanical engineering subject areas. 2. Capable to design and analysis and sizing of shaft, spring, various types of bearings and various types of gear as well. 3. Able to understand the safety measures and other issues like environmental factor while selecting and/or designing mechanical components/systems. 4. Capable to develop new computer-based techniques for the selection, analysis and synthesis of mechanical components/systems. | | |
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| Email I'd | ashokbhatia@soaneemrana.org | Phone No. | 798-815-8760 |
| Student Name | | Student Reg No. | |

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| Part A | | | |
| Question : 1 | Define velocity ratio. | | |
| Lesson Plan No. - 12 | Topic - Gears | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 2 | Define equivalent twisting moment and equivalent bending moment. | | |

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| Lesson Plan No. - 7 | Topic - Shaft | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 3 | Explain torsional Rigidity and lateral rigidity. | | |
| Lesson Plan No. - 8 | Topic - Shaft | Source - Machine Design by R.S. Khurmi | CO No. - 1 |
| Question : 4 | What is a key ? State its function. | | |
| Lesson Plan No. - 9 | Topic - Keys | Source - Machine Design by R.S. Khurmi | CO No. - 4 |
| Question : 5 | Discuss the function of a coupling. | | |
| Lesson Plan No. - 11 | Topic - Coupling | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 6 | Differentiate between rigid coupling and flexible coupling | | |
| Lesson Plan No. - 4 | Topic - Coupling | Source - Machine Design by R.S. Khurmi | CO No. - 3 |
| Question : 7 | Define module. | | |
| Lesson Plan No. - 13 | Topic - Gears | Source - Machine Design by R.S. Khurmi | CO No. - 1 |
| Question : 8 | Write the face width range in terms of module for helical gears | | |
| Lesson Plan No. - 14 | Topic - Helical Gear | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 9 | Define the following terms used in worm gearing : (a) Lead; (b) Lead angle; | | |
| Lesson Plan No. - 16 | Topic - Worm Gear | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 10 | Write the expression for formative or equivalent number of teeth for helical gears. | | |
| Lesson Plan No. - 14 | Topic - Helical Gear | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Part B | | | |
| Question : 1 | Explain design procedure to be followed for spur gear. | | |
| Lesson Plan No. - 12 | Topic - Spur Gear | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 2 | Explain design procedure to be followed for designing of muff coupling. | | |
| Lesson Plan No. - 7 | Topic - Muff Coupling | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 3 | What are its advantages of flexible coupling? | | |
| Lesson Plan No. - 11 | Topic - Flange Coupling | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 4 | Derive an expression for lewi's equation. | | |
| Lesson Plan No. - 12 | Topic - Spur Gear | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 5 | A shaft 80 mm diameter transmits power at maximum shear stress of 63 MPa. Find the length of a 20 mm wide key required to mount a pulley on the shaft so that the stress in the key does not exceed 42 MPa. | | |
| Lesson Plan No. - 9 | Topic - Keys | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 6 | Explain the different terminology associated with gears with neat sketch. | | |
| Lesson Plan No. - 12 | Topic - Gears | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Part C | | | |
| Question : 1 | Design a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m. The working stress in the bolts should not exceed 30 MPa. Assume the allowable shear stress of 40 MPa and crushing stress 80 MPa for shaft and key materials. The maximum torque is 25% greater than the full load torque. The shear stress for cast iron is 14 MPa. | | |
| Lesson Plan No. - 9 | Topic - Flange Coupling | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 2 | Design 20° involute worm and gear to transmit 10 kW with worm rotating at 1400 r.p.m. and to obtain a speed reduction of 12 : 1. The distance between the shafts is 225 mm. | | |

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| Lesson Plan No. - 15 | Topic - Worm Gears | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Question : 3 | Design a clamp coupling to transmit 30 kW at 100 r.p.m. The allowable shear stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the mu and the shaft surface may be taken as 0.3. | | |
| Lesson Plan No. - 10 | Topic - Coupling | Source - Machine Design by R.S. Khurmi | CO No. - 2 |
| Upload Scanned Document In Case of Numerical or Diagram For Any of The Above Questions. (Mention question number with relevant fig / numerical / equations. Max 150 KB) | | | |
| I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question. | |  | |

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