

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 / 92

Instructions for Students / Faculty

Mid Term I (Total 40 Marks, 1.5 HRS., Syllabus from Unit-1)

- Part A: Total number of questions to be given are four (2 from CO1 and 2 from CO2), 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 six (3 from CO1 and 3 from CO2), out of which student has to answer four (2 from CO1 and 2 from CO2). They are long answer type (**Not More Than 50 Words for Question Only**), each carrying 4 marks. Total 16 marks.
- Part C: Total number of questions to be given are four (2 from CO1 and 2 from CO2), out of which student has to answer two (1 from CO1 and 1 from CO2). They are numerical answer type / fully elaborative type* (**Not More Than 70 Words for Question Only**), each carrying 8 marks. Total 16 marks.

Mid Term II (Total 60 Marks, 2 HRS., Syllabus from Unit- 2)

- Part A: Total number of questions to be given are ten (5 from CO3 and 5 from CO4), 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 (3 from CO3 and 3 from CO4), out of which student has to answer four (2 from CO3 and 2 from CO4). They are long answer type (**Not More Than 50 Words for Question Only**), each carrying 4 marks. Total 16 marks.
- Part C: Total number of questions to be given are four (2 from CO3 and 2 from CO4), out of which student has to answer any two (1 from CO3 and 1 from CO4). They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question Only**) *, each carrying 12 marks. Total 24 marks.

Mid Term III (Total 60 Marks, 2 HRS., Syllabus from Unit- 3)

- Part A: Total number of questions to be given are ten (5 from CO5 and 5 from CO6), 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 (3 from CO5 and 3 from CO6), out of which student has to answer four (2 from CO5 and 2 from CO6). They are long answer type (**Not More Than 50 Words for Question Only**), each carrying 4 marks. Total 16 marks.
- Part C: Total number of questions to be given are four (2 from CO5 and 2 from CO6), out of which student has to answer any two (1 from CO5 and 1 from CO6). They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question Only**) *, each carrying 12 marks. Total 24 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).

Instructions For Faculties:

There should be total 6 Course Outcomes (COs) for each subject.

- Mid Term Question Papers are to be submitted as per Course Outcomes (COs) which should be divided equally in Part A, Part B and Part C according to Mid Term Examination and Credit Point.
- In Mid Term-1, the questions are to be given from CO1 and CO2. In Mid Term-2, the questions are to be given from CO3 and CO4. Similarly, in Mid Term-3, the questions are to be given from CO5 and CO6.
- FACULTY MEMBERS, PLEASE ENSURE EXCEPT ABOVE LISTED SUBJECTS, NO THEORITICAL ELABORATIVE QUESTION SHOULD BE GIVEN IN PART 'C' OF QUESTION PAPER

INSTRUCTION FOR STUDENTS

- 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

Type of Exam	Internal Improvement Exam	Date of Submission	15/03/2021
Name of Faculty	Mr. Ashok Bhatia	Date of Examination	22/03/2021
Course	B.Tech (Mechatronics Engineering)	Semester	SEMESTER : 5
Batch	Third (3)	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)

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	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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Student Name		Student Reg No.	

Part A

INSTRUCTIONS FOR PART A: ALL THE QUESTIONS ARE COMPULSORY TO ATTEND

1. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.

Question : 1 Explain torsional Rigidity and lateral rigidity.

Lesson Plan No. - 8	Topic - Shaft	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 2 Discuss the function of a coupling.

Lesson Plan No. - 11	Topic - coupling	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 3 Write the face width range in terms of module for helical gears.

Lesson Plan No. - 14	Topic - Gears	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 4 Define velocity ratio.

Lesson Plan No. - 12	Topic - Gears	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 5 Define equivalent twisting moment and equivalent bending moment.

Lesson Plan No. - 7	Topic - Shaft	Source - Machine Design by R.S. Khurmi	CO No. -
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2. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.

Question : 6 Differentiate between rigid coupling and flexible coupling.

Lesson Plan No. - 4	Topic - coupling	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 7 Define module.

Lesson Plan No. - 13	Topic - Gears	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 8 Define the following terms used in worm gearing : (a) Lead; (b) Lead angle;

Lesson Plan No. - 16	Topic - Bevel Gears	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 9 Write the expression for formative or equivalent number of teeth for helical gears.

Lesson Plan No. - 14	Topic - Helical Gears	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 10 Discuss the function of a coupling.

Lesson Plan No. - 11	Topic - coupling	Source - Machine Design by R.S. Khurmi	CO No. -
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Part B

FOR MIDTERM 1 - Part B: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student has to answer four (2 from CO1 and 2 from CO2).
FOR MIDTERM 2 - Part B: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student has to answer four (2 from CO3 and 2 from CO4).
FOR MIDTERM 3 - Part B: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student has to answer four (2 from CO5 and 2 from CO6)

3. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE. 2

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. -
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Question : 2 Explain design procedure to be followed for designing of muff coupling.

Lesson Plan No. - 7	Topic - coupling	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 3 Derive an expression for lewi's equation.

Lesson Plan No. - 12	Topic - Gears	Source - Machine Design by R.S. Khurmi	CO No. -
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4. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE. 3

Question : 4 Find the diameter of a shaft to transmit twisting moments varying from 800 N-m to 1600 N-m. The ultimate tensile strength for the material is 600 MPa and yield stress is 450 MPa. Assume the stress concentration factor = 1.2, surface finish factor = 0.8 and size factor = 0.85.

Lesson Plan No. - 6	Topic - Shaft	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 5 What is a self-energizing brake ? When a brake becomes self-locking.

Lesson Plan No. - 19	Topic - Brakes	Source - Machine Design by R.S. Khurmi	CO No. -
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Question : 6 Where are the angular contact and self-aligning ball bearings used? Draw neat sketches of these bearings.


Lesson Plan No. - 25	Topic - bearings	Source - Machine Design by R.S. Khurmi	CO No. -
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Part C

FOR MIDTERM 1 - Part C: Total number of questions to be given are four (2 from CO1 and 2 from CO2), out of which student has to answer two (1 from CO1 and 1 from CO2).
FOR MIDTERM 2 - Part C: Total number of questions to be given are four (2 from CO3 and 2 from CO4), out of which student has to answer any two (1 from CO3 and 1 from CO4).
FOR MIDTERM 3 - Part C: Total number of questions to be given are four (2 from CO5 and 2 from CO6), out of which student has to answer any two (1 from CO5 and 1 from CO6).

5. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE. 3

Question : 1 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 r.p.m. for an average life of 5 years at 10 hours per day. Assume uniform and steady load.

Lesson Plan No. - 25	Topic - Bearings	Source - Machine Design by Khurmi	CO No. -
Question : 2	Name the different types of clutches. Describe with the help of neat sketches the working principles of two different types of friction clutches.		
Lesson Plan No. - 21	Topic - Clutch	Source - Machine Design by Khurmi	CO No. -
6. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			2
Question : 3	A 150 mm diameter shaft supporting a load of 10 kN has a speed of 1500 r.p.m. The shaft runs in a bearing whose length is 1.5 times the shaft diameter. If the diametral clearance of the bearing is 0.15 mm and the absolute viscosity of the oil at the operating temperature is 0.011 kg/m-s, find the power wasted in friction		
Lesson Plan No. - 24	Topic - Journal Bearings	Source - Machine Design by Khurmi	CO No. -
Question : 4	What is the procedure followed in designing a journal bearing?		
Lesson Plan No. - 24	Topic - Bearings	Source - Machine Design by Khurmi	CO No. -
Upload Scanned Document In Case of Numerical or Diagram For Any of The Above Questions. <i>(Mention question number with relevant fig / numerical / equations. Max 150 KB)</i>			
I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question.			
Corporate Office: H 974, Palam Extension, Part 1, Sector 7, Dwarka, New Delhi 110077			

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