School of Aeronautics (Neemrana)
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APPROVED BY ALL INDIA COUNCIL FOR TECHNICAL EDUCATION & AFFILIATED TO RAJASTHAN TECHNICAL UNIVERSITY, KOTA
& BIKANER TECHNICAL UNIVERSITY, BIKANER, RUN & MANAGED BY L N VERMA MEMORIAL SOCIETY

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Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 94 / SET 1

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

Instructions for Students / Faculty

Mid Term I (Total 60 Marks, 2 HRS. Syllabus from Unit-1)

- Part A: Total number of questions to be given are six (3 from CO1 and 3 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 12 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)**, each carrying 4 marks. Total 16 marks.

- Part C: 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 numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)***, each carrying 8 marks. Total 32 marks.

Mid Term II (Total 90 Marks, 2.5 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 3 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 30 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)**, each carrying 6 marks. Total 24 marks.

- Part C: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student has to answer any four (2 from CO3 and 2 from CO4). They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)***, each carrying 9 marks. Total 36 marks.

Mid Term III (Total 90 Marks, 2.5 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 3 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 30 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)**, each carrying 6 marks. Total 24 marks.

- Part C: 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 numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)***, each carrying 9 marks. Total 36 marks.

* **LIST OF ELABORATIVE THEORY QUESTION SUBJECTS**: 3 MH4 - 07 Manufacturing Process, 4 AN4 - 06 Aircraft Materials and Processes (Cr 3), 5 AN4 - 05 Aircraft System (Cr 3), 6 AN4 - 05 Avionics-I (Cr 3), 6 MH4 - 03 Applied Hydraulics & Pneumatics (Cr 3), 6 MH5 - 11 Principles of Management (Cr 3), 6 MH5 - 13 Aircraft Electronics System (Cr 3), 7 AN5 - 12 Maintenance of Airframe and System (Cr 3), 7 AN5 - 13 Helicopter Theory (Cr 3), 7 AG6 - 60.1 Human Engineering and Safety (Cr 3), 7 ST - 01 Avionics II (Special Theory Subject) (Cr 3), 7 MH5 - 11 Design of Mechatronics Systems (Cr 3), 7 MH5 - 12 Robotics and Machine Vision System (Cr 3), 7 MH6 - 13 Medical Electronics (Cr 3), 7 AN6 - 60.1 Aircraft Avionic System (Cr 3), 8 AN5 - 12 Maintenance of Power Plant and System

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NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

(Cr 3), 8 AN5 - 13 Unmanned Aerial Vehicles & Systems (UAV) (Cr 3), 8 MH5 - 13 Product Development & Launching (Cr 3), 8 EC6 - 60.2 Robotics and control (Cr 3)

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,**

QUESTION PAPER & STUDENTS DETAILS

Type of Exam	Internal Improvement Exam	Date of Submission	21/03/2021
Name of Faculty	Ms. Bhawna Sharma	**Date of Examination**	22/03/2021
Course	B.Tech (Mechatronics Engineering)	**Semester**	SEMESTER : 5
Batch	Fourth (4)	**Subject**	5 MH4 - 03 Sensors (Cr 3)-

COURSE OUTCOMES FOR REFERENCE TO FRAME QUESTION PAPERS
(Faculties are required to mention Course Outcome Number against each part of the question paper)

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

Course Outcome	5MH4 - 03 Sensors (credit-3) COURSE OBJECTIVE 1. To build a strong foundation in Sensors for Mechatronics engineers 2. To familiarize the students with various applications-Industrial and non-industrial 3. To educate students about the basic concepts of sensors, Different types of Sensors, Strain gauge, resolution, accuracy, sensitivity 4. To familiarize the students with Magnetostrictive type sensor, LVDT: Construction, working and it's serviceability 5. To Impart the knowledge of Capacitive sensors, piezoelectric effect, ultrasonic sensors. 6. To make students understand the Thermal sensors, Material used, RTD, Thermister, Thermoemf sensor 7. To educate students about the Magnetic sensors, Wiedemann effect, Villari effect, Hall effect, LDR, photodiodes. 8. To study the concept of Smart Sensors-film sensor, Radiation Sensors, and their applications 9. To make students aware of Wireless Sensor Networks (WSNs), WSN vs Adhoc Networks, Sensor node architecture, and its various applications COURSE OUTCOME 1. Able to demonstrate an understanding of the fundamentals of Sensors 2. Proficient to understand different types of Sensors, Strain gauge, resolution, accuracy, sensitivity 3. Capable to understand applications of Sensors 4. Gain an understanding of working and construction of LVDT and Magnetostrictive type sensor 5. Competent to understand Capacitive sensors, piezoelectric effect, ultrasonic sensors. 6. Students will be able to describe the concept of Thermal sensors, Material used, RTD, Thermister, Thermoemf sensor 7. Capable to explain Magnetic sensors, Wiedemann effect, Villari effect, Hall effect, LDR, photodiodes. 8. Students will be able to grab a basic understanding of Smart Sensors-film sensor, Radiation Sensors, and their applications make 9. Students will be able to differentiate between WSN & Adhoc Networks 10. Able to understand Wireless Sensor Networks (WSNs) and apply its various applications.
Email I'd	bhawnasharma@soaneemrana.org	**Phone No.**	955-765-8148
Student Name		**Student Reg No.**	

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.	CO 1
Question : 1	State the principle of pyroelectric type sensor?

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

22	Thermo emf sensor	Handbook of sensor by Jacob Fraden	
Question : 2	Define villari effect?		
23	Magnetic sensors	Handbook of sensor by Jacob Fraden	
Question : 3	State hall effect?		
25	Magnetic sensors	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 4	State the the principle of LVDT?		
7	Sensing & Transduction	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 5	Define the sensitivity and accuracy of a sensor?		
2	Sensing & Transduction	A course in Electrical ans Electronics Technology by A.K Sawhney	
2. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.		CO 2	
Question : 6	Calculate the sensitivity for dielectric constant type capacitive transducer.		
13	Capacitive transducers	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 7	Distinguish between sensor and transducer.		
1	Introduction	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 8	Define the types of piezoelectric elements.		
15	Piezoelectric sensors	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 9	Define resolution and sensitivity		

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3	Resistive sensors	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 10	Discuss some of the application of thermal sensor.		
17	Thermal sensor	Handbook of sensor by Jacob Fraden	

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 must 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 must 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.		CO 1
Question : 1	Explain variable distance-parallel plate type and variable area parallel plate capacitive transducer.	
9	Capacitive transducer	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 2	Explain piezoelectric effect and its crystal model.	
14	Piezoelectric sensors	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 3	Explain reluctance change type and mutual inductance change type Inductive transducer.	
6	Inductive sensors	A course in Electrical ans Electronics Technology by A.K Sawhney	
4. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.		
Question : 4	Explain GM counter.	
28	GM counter	Handbook of sensor by Jacob Fraden	
Question : 5	Explain the working of Magnetostrictive type inductive sensor.	
6	Inductive sensor	Handbook of sensor by Jacob Fraden	

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NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

Question : 6	Explain the working of LVDT.		
7	LVDT	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 7 (Old Pattern)			

PART C	

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

5. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.		
Question : 1	The output of an LVDT is connected to a 5V Voltmeter through an amplifier whose amplification factor is 250. An output of 2mV appears across the terminals of LVDT when the core moves through a distance of 0.5mm. Calculate the sensitivity of the LVDT and whole setup. The milli-voltmeter scale has 100 division. The scale can be read to 1/5 of a division. Calculate the resolution in mm.	
6	LVDT	A course in Electrical ans Electronics Technology by A.K Sawhney
Question : 2	A variable potential divider has a total resistance of 2Kohm and is fed from a 10V supply. The output is connected across a load resistance of 5Kohm. Determine the loading error for the sliding positions corresponding to xi/xt = 0, 0.25, 0.5, 0.75, 1. Use the result to plot a rough graph of loading error against the ratio xi/xt.	
3	Resistive transducer	A course in Electrical ans Electronics Technology by A.K Sawhney
Question : 3	A compressive force is applied to a structural member. The strain is 5 micro strain. Two separate strain gauges are attached to the structural member, one is a nickel wire having a gauge factor of -12.1 and other is a nichrome wire having a gauge factor of 2. Calculate the values of resistance of gauges after straining. The resistance of the strain gauge before being strained is 120 ohm.	
4	Strain Gauge	A course in Electrical ans Electronics Technology by A.K Sawhney

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6. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			CO 2
Question : 4	The output voltage of a LVDT is 1.5 V at maximum displacement. At a load of 0.5 Mohm, the deviation from linearity is maximum and it is +- 0.003 V from a straight line through origin. find the linearity at the given load.		
7	LVDT	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 5	A capacitive sensor consists of two parallel 0.5 cm square plates separated by a distance of 0.1 mm. find the capacitance in pF. If the plates are displaced in parallel direction, find the sensitivity in pf/mm.		
13	Capacitive sensor	A course in Electrical ans Electronics Technology by A.K Sawhney	
Question : 6	Derive the formula for voltage & charge coefficient in piezoelectric effect.		
13	Piezoelectric effect	A course in Electrical ans Electronics Technology by A.K Sawhney	
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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