School of Aeronautics (Neemrana)

Question Paper For Internal Assessment Examination (Theory) - Old Scheme i.e 2012 Syllabus

Instructions For Students / Faculty

Mid Term I (Total 40 Marks, 1 Hr. & 30 Min, Syllabus From Beginning of The Session)

Total number of questions to be given are 8, each carrying 10 marks and it is compulsory to attend 2 questions from each part i.e. Part A and B. There is a choice of two questions out of four in each part. Part A will be theoretical or derivation type **(Not More Than 70 Words For Question).** Part B will be fully numerically oriented questions **(Not More Than 70 Words For Question)**, except for the list of subjects given below. No objective type or fill in the blanks shall be given, but subpart of question can be given for both Part A & B.

Mid Term II (Total 50 Marks, 1 Hr. & 45 Min, Syllabus From Beginning of The Session)

Total number of questions to be given are 8, each carrying 10 marks and it is compulsory to attend 2 questions from Part A and three questions from Part B. There is a choice of two questions out of four in part A and 3 questions out of 4 in Part B. Part A will be theoretical or derivation type **(Not More Than 70 Words For Question).** Part B will be fully numerically oriented questions **(Not More Than 70 Words For Question)**, except for the list of subjects given below. No objective type or fill in the blanks shall be given, but subpart of question can be given for both Part A & B.

Mid Term III (Total 60 Marks, 2 Hrs, Syllabus From Beginning of The Session)

Total number of questions to be given are 10, each carrying 10 marks and it is compulsory to attend 2 questions from Part A and 4 questions from Part B. There is a choice of two questions out of four in part A and 4 questions out of 6 in Part B. Part A will be theoretical or derivation type **(Not More Than 70 Words For Question).** Part B will be fully numerically oriented questions **(Not More Than 70 Words For Question)**, except for the list of subjects given below. No objective type or fill in the blanks shall be given, but subpart of question can be given for both Part A & B.

*** LIST OF ELABORATIVE THEORY QUESTION SUBJECTS**: Aircraft Materials, Aircraft System, Aircraft Rules & Regulation-I, Mechanics of Composite Materials, Aircraft Design, Aircraft Rules & Regulation-II, Avionics-I, Helicopter Theory, Maintenance of Airframe and System Design, Avionics-II, Airlines and Airport Management, Maintenance of Power Plant & Systems

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

STUDENT IS ALLOWED TO ENTER LATE NOT MORE THAN 15 MIN AFTER STARTING OF

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

Mid Term* Mid Term 1

Name of Faculty* Deepak Tomar

Subject* 7MH1 - Micro-Electro-Mechanical System...

Batch Second (2)

Email Id of Faculty:* Deepak7tomar@gmail.com

Date of Submission of QP 05/09/2019

Date of Examination* 07/09/2019

Course* B.Tech (Mechatronics Engine...

Semest... Semester : 7

Phone Number of Faculty* 965 454 4096

Student Name

Student Reg No.

Part A

Question : 1* What are the intrinsic characteristics of a mems device?

Lesson Plan* MEMS Topic* MEMS DEVICES Source* TAI RAN HSU

Question : 2* Discuss energy domains in mems technology also explain semiconductor devices.

Lesson Plan* MEMS Topic* ENERGY DOMAINS Source* TAI RAN HSU

Question : 3* Explain the transducer, actuator and sensor in detail.

Lesson Plan* MEMS Topic* TRANSDUCER Source* TAI RAN HSU

Question : 4* Elaborate electrostatic and parallel plate capacitor sensors.

Lesson Plan* MEMS Topic* SENSOR Source* TAI RAN HSU

Part B

Question : 1* Explain stress and strain analysis in detail.

Lesson Plan* MEMS Topic* STRESS AND STRAIN Source* TAI RAN HSU

Question : 2* What is torsional deflection ? also derive it numerically.

Lesson Plan* MEMS Topic* torsional deflection Source* TAI RAN HSU

Question : 3*	Describe Micro-fabrication of IC in detail.				
Lesson Plan*	MEMS	**Topic***	Micro-fabrication of IC	**Source***	TAI RAN HSU
Question : 4*	Discuss flexural beam bending numerically.				
Lesson Plan*	MEMS	**Topic***	flexural beam bending	**Source***	TAI RAN HSU
Question : 5					
Lesson Plan		**Topic**		**Source**	
Question : 6					
Lesson Plan		**Topic**		**Source**	

Upload Scanned Document In Case of Numerical or Diagram for any of the above question

Mention question number with relevant fig / numerical / equations. Max 150 KB

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I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question.

Answer Sheet Details	
Mid Term	Mid Term 1
Name of Faculty	Deepak Tomar
Subject	7MH1 - Micro-Electro-Mechanical System (Old)
Date of Submission of QP	16/09/2019
Batch	Second (2)
Email Id of Faculty:	Deepak7tomar@gmail.com
Date of Examination	07/09/2019
Course	B.Tech (Mechatronics Engineering)
Semester	Semester : 7
Phone Number of Faculty	965-454-4096

Part A	
Question : 1	Material properties change at micro-scale, different from bulk properties due to grain boundary effect Successful design/manufacturing of MEMS devices need reliable knowledge of MEMS material properties Verification of design and validation of models proposed Calibration of devices and signals Electronic analysis: noise vs signal Research various new effects: example Biosensor devices Noninvasive technique Does not disturb sensitive MEMS device Very high resolutions possible Higher measurement range possible Several optical phenomenon can be made use of
Question : 2	These energy domains include: • Mechanical - force, pressure, velocity, acceleration, position • Thermal - temperature, entropy, heat, heat flow • Chemical - concentration, composition, reaction rate • Radiant - electromagnetic wave intensity, phase, wavelength, polarization reflectance, refractive index, transmittance • Magnetic - field intensity, flux density, magnetic moment, permeability • Electrical - voltage, current, charge, resistance, capacitance, polarization

Question : 3	A transducer is an electrical device which is used to convert one form of energy into another form. In general, these devices deal with different types of energies such as mechanical, electrical energy, light energy, chemical energy, thermal energy, acoustic energy, electromagnetic energy, and so on. The input devices receive the measurand quantity and transfer the proportional analog signal to the conditioning device. The conditioning device modified, filtered, or attenuates the signal which is easily acceptable by the output devices. The sensor is a device that measures the physical quantity (i.e. Heat, light, sound, etc.) into an easily readable signal (voltage, current, etc.). It gives accurate readings after calibration. Examples – The mercury used in the thermometer converts the measurand temperature into expansion and contraction of the liquid which is easily measured with the help of a calibrated glass tube. The thermocouple also converts the temperature to an output voltage which is measured by the thermometer. An actuator is something that actuates or moves something. More specifically, an actuator is a device that converts input energy into motion or mechanical energy.
Question : 4	Principle of electrostatic sensor detection Around electrified object, an electric field that is proportional in strength to the amount of charge is produced. Electrostatic sensors detect the intensity of this electric field and calculate it as electric potential. Detection of electric field When a detection electrode is brought close to an electrified body, an electric charge that is proportional to the intensity of the electric field is induced in the detection electrode due to "electrostatic induction". The capacitor is a two terminal electrical conductor and that is separated by an insulator. These terminals store electric energy when they connected to a power source. One terminal stores positive energy and the other terminal stores negative charge. Charging and discharging of the capacitor can be defined as, when electrical energy is added to a capacitor is called charging whereas releasing the energy from a capacitor is called as discharging. CHARGING OF CAPACITOR When a Capacitor is connected to a circuit with Direct Current (DC) source, two processes, which are called "charging" and "discharging" the Capacitor, will happen in specific conditions
Part B	

Question : 1	Stress Stress is defined as the force per unit area of a material. i.e. Stress = force / cross sectional area: where, σ = stress, F = force applied, and A= cross sectional area of the object. Units of s : Nm-2 or Pa. Tensile stress - stress that tends to stretch or lengthen the material - acts normal to the stressed area compressive stress - stress that tends to compress or shorten the material - acts normal to the stressed area shearing stress - stress that tends to shear the material - acts in plane to the stressed area at right-angles to compressive or tensile stress Strain Strain is defined as extension per unit length. Strain = extension / original length where, ε = strain, lo = the original length e = extension = (l-lo), and l = stretched length Strain has no units because it is a ratio of lengths.
Question : 2	Torsional Deflection of a Shaft Calculator The twisting of an object when a torque is applied is called as the torsion. The degree to which an object bends about its center is termed as the angular deflection. The shear stress in a solid circular shaft in a given position can be expressed as: τ = T r / J (1) where τ = shear stress (Pa, psi) T = twisting moment (Nm, in lb) r = distance from center to stressed surface in the given position (m, in) J = Polar Moment of Inertia of Area (m4, in4) Note the "Polar Moment of Inertia of an Area" is a measure of a shaft's ability to resist torsion. The "Polar Moment of Inertia" is defined with respect to an axis perpendicular to the area considered. It is analogous to the "Area Moment of Inertia" - which characterizes a beam's ability to resist bending - required to predict deflection and stress in a beam. "Polar Moment of Inertia of an Area" is also called "Polar Moment of Inertia", "Second Moment of Area", "Area Moment of Inertia", "Polar Moment of Area" or "Second Area Moment".

Question : 3	Integrated Circuit (IC) An Integrated Circuit (IC) is also called as chip or microchip. It is a semiconductor wafer in which millions of components are fabricated. The active and passive components such as resistors, diodes, transistors etc and external connections are usually fabricated in on extremely tiny single chip of silicon. All circuit components and interconnections are formed on single thin wafer (substrate) is called monolithic IC. IC is very small in size. It require microscope to see connections between components. The steps to fabricate IC chips is similar to the steps required to fabricate transistors, diodes etc. In IC chips, the fabrication of circuit elements such as transistors, diodes, capacitors etc. and their interconnections are done at same time. It has so many advantages such as extremely small size, small weight, low cost, low power consumption, .high processing speed, easy replacement, etc. IC is the principal component in all electronic devices. IC can function as amplifier, oscillator, timer, counter, computer memory etc. Wafer production The first step is wafer production Masking To protect some area of wafer when working on another area, a process called photolithography is used Etching It removes material selectively from the surface of wafer to create patterns.Doping To alter the electrical character of silicon, atom with one less electron than silicon such as boron and atom with one electron greater then silicon such as phosphorous are introduced into the area. Metallization It is used to create contact with silicon and to make interconnections on chip
Question : 4	Flexural Stresses In Beams A beam is a structural member whose length is large compared to its cross sectional area which is loaded and supported in the direction transverse to its axis. Lateral loads acting on the beam cause the beam to bend or flex, thereby deforming the axis of the beam into a curved line. We shall now consider the stresses and strains associated with bending moments. Pure Bending Assumptions: 1. Beam is straight before loads are applied and has a constant cross-sectional area. 2. Beam has a longitudinal plane of symmetry and the bending moment lies within this plane. 3. Beam is subjected to pure bending (bending moment does not change along the length). 4. Beam material is homogeneous and isotropic. Experiments show that beams subjected to pure bending (see above) deform is such a way that plane sections remain plane. In other words, planes perpendicular to the longitudinal axis before loading remain plane and perpendicular to the axis after loading. Beam sections rotate relative to one another when the beam deforms.
Question : 5	

Question : 6	
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I have scrutinized the answer sheet. There is no spelling mistake or any type of irrelevant answers.	

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