QUESTION BANK

Semester: 8

Scheme: 2019

Questions compiled by

Department of Mechanical Engineering
Vidya Academy of Science and Technology Technical Campus, Kilimanoor, Thiruvanathapuram

QUESTION BANK

MET402 MECHATRONICS

Module 1			
No	**Question**	**Mark**	**Year**
1	Compare the working of resolver and synchro	7	May 2019
2	Suggest two applications of Hall effect sensor in mechatronic systems	7	May 2019
3	Describe the terms hysteresis error and non-linearity error.	6	May 2019
4	Differentiate between absolute and incremental encoders	5	May 2019
5	Explain the working of an optical absolute encoder. How the number of tracks and sectors of absolute encoder is related to the resolution of the encoder?	5	May 2019
6	Draw the encoder wheel layout of a grey coded absolute encoder with 45degree resolution	5	May 2019
7	Explain the working of a double acting hydraulic actuator	6	May 2019
8	Why cushioning is necessary for pneumatic actuators	5	May 2019
9	Explain how cushioning is achieved in pneumatic actuators with a sketch	5	May 2019
10	Explain the working of incremental and absolute optical rotary encoders. Why gray code is used in coding absolute encoders	6	December 2019
11	Describe the working of LVDT with a neat sketch.	5	December 2019
12	Explain the working of any one type each of flow and pressure sensors.	6	December 2019
13	Define the following sensor characteristics (i) Time constant (ii) Hysteresis	7	September 2020
14	Explain the principle of Hall effect. How a proximity sensor works on the basis of Hall effect?	5	September 2020
15	Illustrate the working principle of incremental and absolute rotary encoders.	4	September 2020
16	Compare binary and grey code encoders	7	September 2020
17	Explain with schematic diagram the working of synchros.	5	December 2020

18	Illustrate the principle of operation of turbine meter for the measurement of liquid flow.	5	December 2020
19	Some temperature-controlled switches are operated by bimetallic strips. Describe how they work	5	December 2020
20	Explain any two static characteristics of a sensor	7	December 2020
21	Illustrate the working of two modes in an ultrasonic proximity sensor. Comment on the dead band of an ultrasonic proximity sensor.	7	August 2021
22	Graphically represent the method to find out the non-linearity error	5	August 2021
23	Distinguish between incremental and absolute encoders with neat sketches.	4	August 2021
24	Compare binary and grey code encoders	6	August 2021
25	With a neat sketch illustrate the function of cylinder end cushioning	6	August 2021
26	Explain the main components of a Mechatronic Measurement system using block diagram	6	December 2021
27	Describe the terms (i) Non Linearity Error (ii) Response time (iii) Output impedance	5	December 2021
28	Explain the principle of (i) Eddy current proximity sensors (ii) Pyroelectric sensors	4	December 2021
29	Explain the basic principle of an Accelerometer	7	December 2021
30	What is the working principle of RTD? List out its advantages and disadvantages	5	June 2022
31	Explain the working of eddy current proximity sensor	6	June 2022
32	Compare the encoder wheel layout of binary code absolute encoder and grey code absolute encoder with 45° resolution. Mention the binary to grey code conversion using tabular format	4	June 2022
33	Explain the different static & dynamic characteristics of a sensor	5	January 2023
34	Explain the working of a (i) Rotary Potentiometer (ii) Acoustic Emission Sensors	4	January 2023
35	Illustrate the working of a Differential transformers	5	January 2023

36	Differentiate between an Absolute and Incremental Encoder. List down the application.	6	January 2023
37	Explain the working of a double acting cylinder with a neat figure	4	January 2023
38	What is the purpose of cushioning in double acting cylinder	7	January 2023

Module 2

No	Question	Mark	Year
1	What is a 4/3 way valve? When is it used in place of 4/2 way valves	4	May 2019
2	Design a hydraulic circuit to operate a winch fitted with a hydraulic motor. The motor should be run clockwise, counter clockwise and stopped. Use a manually operated valve.	7	May 2019
3	Develop a pneumatic circuit with standard symbols, to operate two cylinders in sequence. Explain its working	7	December 2019
4	Mention any two differences between finite position and infinite position valves	6	December 2019
5	Illustrate the working of spool valve and poppet valve with a neat sketch.	5	December 2019
6	With a neat sketch explain the working of diaphragm operated process control valve	5	September 2020
7	Explain the working of any one type of rotary actuator with a neat sketch	5	September 2020
8	Distinguish between pilot operated and direct operated DCVs	6	September 2020
9	A double acting cylinder is to be advanced either by operating a push button or by a foot pedal. Once the cylinder is fully advanced, it is to be retracted to its initial position. A 3/2-way roller lever valve is to be used to detect the full extension of the cylinder. Design a pneumatic circuit for this application.	5	September 2020
10	Draw the symbol for a pressure sequence valve.	5	December 2020
11	Design a circuit in which pressure sequence valve is used to initiate an operation only when another operation has been completed.	6	December 2020
12	What is meant by rotary actuator?	5	December 2020

13	Draw a vane motor and show important parts.	6	December 2020
14	With a neat diagram explain the working of pilot operated check valve.	7	December 2020
15	Illustrate the working of spool valve and poppet valve with a neat sketch	5	August 2021
16	A plastic component is to be embossed by using a die which is powered by a double acting cylinder. The return of the die is to be effected when the cylinder rod has fully extended to the embossing position and the preset pressure is reached. A roller lever valve is to be used to confirm full extension. The signal for retracting must only be generated when the piston rod has reached the embossing position. The pressure in the piston chamber is indicated by a pressure gauge. Design a pneumatic circuit for the above-mentioned application.	4	August 2021
17	Explain the working of a process control valve using suitable figure. Also list down different plug shapes and type of valve seats used in process control valve.	7	December 2021
18	Draw the symbol for a Direction control valve (i) 4/2 valve (ii) 4/3 valve	5	December 2021
19	A conveyor belt carries the finished product. A double acting cylinder is used for a transfer station to remove the products from the conveyor belt, when a push button is operated. At the point where the push button is released the double acting cylinder returns to its original position. Design a pneumatic system circuit for the given application	5	December 2021
20	Explain the working of pressure-limiting valve and pressure sequence valve with a neat sketch. Draw the symbol for the same.	5	June 2022
21	Discuss the use of diaphragm actuator in process control valves	7	June 2022
22	Illustrate the working of an accumulator in hydraulic power supply.	7	June 2022
23	Sketch the following valve bodies used in process control valves. (i) Single-seated, normally open (ii) Single-seated, normally closed	5	June 2022
24	List any 2 controlling factors in wet etching.	4	May 2019
25	Differentiate between immersion etching and spray etching.	6	May 2019
26	Describe the dry etching process in MEMS micromachining	6	May 2019
27	Explain the LIGA process in MEMS fabrication with neat sketches	6	May 2019
28	Explain the principle, fabrication and working of MEMS based capacitive type pressure sensor.	5	December 2019

29	Describe the DRIE process with a neat sketch.	4	December 2019
30	Prepare a comparative report of each one technique in CVD and PVD.	7	December 2019
31	Distinguish between bulk micromachining and surface micromachining with sketches	5	September 2020
32	Illustrate the sequence of operations in LIGA process with neat sketches	6	September 2020
33	Distinguish between wet chemical etching and dry plasma etching. What are the advantages of dry plasma etching over wet chemical etching	4	September 2020
34	Explain the fabrication of MEMS based pressure sensor	5	September 2020
35	Explain evaporation process for MEMS fabrication with neat sketch.	4	December 2020
36	Compare dry etching process with wet etching process.	5	December 2020
37	What is a gyroscope? Describe the working of MEMS based piezoelectric plate gyroscope with suitable diagram. Also Illustrate the steps in its fabrication.	6	December 2020
38	Distinguish between positive and negative photoresist	4	August 2021
39	Illustrate the processing sequence in photolithography for micro fabrication with neat sketch.	7	August 2021
40	With a neat sketch explain any one method of vapour synthesis in PVD	5	August 2021
41	Explain Deep Reactive Ion Etching. What are the advantages of dry plasma etching over wet chemical etching?	5	August 2021
42	Explain the procedure of photolithography using suitable figures	6	December 2021
43	Differentiate between isotropic and anisotropic wet etching	7	December 2021
44	Write the different steps involved in the fabrication of a MEMS pressure sensor use suitable figures to represent each step	6	December 2021
45	An airbag deployment system in automobile utilizes change in capacitance or peizoresistivity to sense a crash. Suggest the configuration and working of MEMS device used in the system	6	June 2022
46	Illustrate the process of bulk micromachining and surface micromachining.	5	June 2022
47	Distinguish between positive and negative resist. Include sketches	5	June 2022

48	A work piece is pushed into position by cylinder A and is clamped by cylinder B. The damping achieved at pre-set pressure. Design the pneumatic circuit for the application	4	January 2023
49	Explain Deep Reactive Ion Etching process using suitable figures	7	January 2023
50	Explain surface micromachining process	4	January 2023
51	Explain LIGA process using suitable figures. Write down the advantages and disadvantages of LIGA process	5	January 2023
52	What are the major advantages of Surface Micromachining process	5	January 2023

Module 3

No	Question	Mark	Year
1	Mention any 2 functions of guide ways in machine tools.	7	May 2019
2	Comment on the stick-slip phenomenon associated with friction guide ways.	5	May 2019
3	Explain the working of LM guide ways	5	May 2019
4	Compare the salient features of hydrostatic and hydrodynamic bearing.	7	December 2019
5	Explain the mechanism of recirculating ball screw with neat sketch. How backlash can be avoided? What are the advantages of recirculating ball screw?	7	September 2020
6	Name the technique used to eliminate backlash in a ball screw. Illustrate the method of doing it.	6	December 2020
7	Explain the stick slip phenomenon	5	August 2021
8	Illustrate the working of recirculating ball screw with neat sketch	4	August 2021
9	What are the advantages of recirculating ball screw?	4	August 2021
10	What are the different shapes of Slideways that are commonly used? What are their advantages & Disadvantages?	5	June 2022
11	Draw the response curve for an under-damped system.	5	May 2019
12	List three types of models and give an example each	6	May 2019
13	Develop a mathematical model for the chassis of a car as a result of a wheel moving along a road.	5	December 2019

14	Write down the describing equations of basic mechanical building blocks.	5	September 2020
15	Derive the mathematical model for a quarter car suspension system	6	September 2020
16	What are the basic building blocks of mechanical systems? Obtain their describing equations.	7	December 2020
17	Propose a model for the metal wheel of a railway carriage running on a metal track	7	December 2020
18	Derive the mathematical model for a thermometer at temperature T which has been inserted into a liquid at temperature TL. Show how the temperature T vary with respect to time.	6	August 2021
19	Derive the mathematical model for the fluid system shown in the figure.	5	August 2021
20	Write down the describing equations of Hydraulic system & Thermal system	5	December 2021
21	The figure below shows a thermal system consisting of an electric fire in a room. The fire emits heat at the rate q1 and the room loses heat at the rate q2. Develop a mathematical model which describes the change in room temperature with reference to time. Assume that the air in the room is at a uniform temperature T and that there is no heat storage in the walls of the room. Assume any missing parameters.	7	June 2022
22	Explain the working of a Re-circulating ball screws	5	January 2023
23	Explain the two Adaptive controls for machine tools	5	January 2023

Module 4

No	Question	Mark	Year
1	Develop a PLC ladder program for the following sequence: Start a motor with push switch, and then after a delay of 90s, starta pump. When the motor is switched off, the pump will get switched off after a delay of 5s. Mention the logic used for each rung in the program to substantiate your answer.	7	May 2019
2	Explain the working of a mechanical device using closed loop control system with the help of a suitable example	5	December 2019
3	Two motors are to be controlled in a sequence. The second motor starts 30 seconds after the starting of first motor by a push switch. Develop a PLC ladder diagram for the following cases and describe the circuit. Case (A): Only one motor operates at a time. Case (B): Both the motor gets off together after 50 seconds.	5	December 2019

4	What is latching? Draw a simple latched circuit	7	September 2020
5	Consider a pneumatic system with single-solenoid controlled valves and involving two cylinders A and B, with limit switches a–, a+, b–, b+ detecting the limits of the piston rod movements. Design a ladder programme with the requirement being when the start switch is triggered, the sequence A+, B+, A–, 10s time delay, B– occurs and stop at that point until the start switch is triggered again	7	September 2020
6	Explain two methods used for input/output processing in PLC.	6	December 2020
7	Represent the basic structure of PLC with the help of a block diagram.	5	December 2020
8	What is the purpose of cascaded timers in PLC? Explain with example.	4	December 2020
9	Design a PLC ladder program to enable a three-cylinder, double solenoidcontrolled arrangement to give the sequence A+, A–, A+, A–, A+, A–, B+, C+, B–, C–. The A+, A– sequence has to be repeated three times before B+, C+, B– , C– occur. Explain the logic used.	4	August 2021
10	Compare the working of gain-scheduled control and self-tuning control in adaptive control systems.	5	December 2021
11	Draw ladder diagram for following logic functions – XOR, NAND, NOR, AND	5	December 2021
12	Explain Internal Relays and Shift Registers	6	December 2021
13	Explain latching in PLC logic	5	December 2021
14	Differentiate between an open loop and closed loop control system	5	June 2022
15	Explain the internal architecture of PLC with a neat sketch. Mention the three features of PLC which are specific to their use as controller.	6	June 2022
16	With a block diagram, illustrate the elements of a control system	7	May 2019
17	Draw a block diagram of a feedback control system	7	May 2019
18	Draw a flowchart and discuss the steps in frequency domain analysis	6	May 2019
19	With the help of a neat sketch explain the different mechatronics modules used in automatic car park barrier system	5	September 2020
20	With the help of a block diagram show different elements of car engine management system. Explain functions of important components.	5	December 2020

21	Describe the different mechatronics systems used in the modern automobile engine management system.	7	August 2021
22	Design PLC based pick and place robot. Draw the gripper movement and the arm control diagram	5	December 2021
23	Discuss the working of mechatronics system-based automobile engine management system with the help of a neat sketch and block diagram.	5	June 2022
24	Explain the physical system and working of a pick and place robot with a neat sketch.	6	June 2022
25	Develop a PLC ladder program for the following sequence: Provide lubricant for the gear box before the lathe spindle starts to run which aims to ensure that the oil pump motor starts first and the main motor starts subsequently	10	January 2023

Module 5

No	Question	Mark	Year
1	Draw a schematic of a magneto-resistive tactile sensor and list any three features of the sensor	5	May 2019
2	List any four techniques to measure an unknown force	7	May 2019
3	Draw the sketch of the basic configuration of a laser-based triangulation range finder	5	May 2019
4	A stepper motor is to be used to drive a linear axis of a mechatronic system. The motor output shaft is connected to a screw thread with a 30 mm pitch. It is desired to control each axis at 0.5 mm. What is the corresponding step angle?	7	May 2019
5	Draw the schematic diagram of a machine vision system.	6	May 2019
6	List the steps in thresholding technique in image processing.	6	May 2019
7	Write a short note on the applications of vision sensors.	4	May 2019
8	With a neat sketch, explain the physical system and working of a pick and place robot	5	May 2019
9	List any four applications of robotic vision systems.	7	May 2019

10	Draw sketches to discuss any two objectives of image segmentation.	5	May 2019
11	With a flowchart, explain the steps in building of a smart system for automatic car park barrier system	5	May 2019
12	List any two advantages of charge injection device camera for machine vision applications	5	May 2019
13	With a sketch, discuss 'equalization' method in histogram processing.	4	May 2019
14	Compare the working of permanent magnet stepper motor, variable reluctance stepper motor and hybrid stepper motor with a neat sketch. Mention the step angle achieved in each case	4	December 2019
15	Illustrate the working of any one type of (i) Force sensor (ii) Tactile sensor.	5	December 2019
16	Comment on the thresholding technique used in image processing and analysis. Explain how thresholding is employed in edge detection.	4	December 2019
17	Explain the histogram processing technique in image processing	6	December 2019
18	Illustrate the working of Charge Coupled Device for machine vision applications.	5	December 2019
19	Explain the working of Barcode reader with reference to the coding schemes. Mention the steps to process the digits in a barcode for a particular product. Develop the steps in a program for reading the barcode	6	December 2019
20	Illustrate the working of harmonic drive with neat sketches. List out its applications	5	September 2020
21	What are the advantages of harmonic drive?	6	September 2020
22	Explain the working of piezoelectric type tactile sensor	7	September 2020
23	Explain the constructional features and working of brushless DC motor	5	September 2020
24	Illustrate the working of Vidicon camera and CCD with neat sketches	5	September 2020
25	Explain how thresholding is used for segmentation in industrial vision applications?	5	September 2020
26	Illustrate the histogram processing technique for enhancing the image contrast	6	September 2020
27	Explain the working principle of any one light based range finder	7	December 2020

28	Illustrate the working of harmonic drives with sketches	4	December 2020
29	Describe the working of a permanent magnet DC motor and brushless permanent magnet DC motor with diagrams. Identify their differences.	5	December 2020
30	Explain histogram processing technique for image processing.	6	December 2020
31	Describe the applications of vision systems with examples.	7	December 2020
32	Using a schematic diagram, explain the working of Vidicon camera.	6	December 2020
33	Compare the effects of resolution and quantization on the usefulness of an image	7	December 2020
34	Illustrate the constructional features and working of harmonic drive with neat sketch. List out its applications	7	August 2021
35	What are the advantages of harmonic drive?	5	August 2021
36	What are the different types of stepper motor? Explain the working of any one type with a sketch.	6	August 2021
37	Explain any one principle of measurement used by laser-based range finder	5	August 2021
38	Illustrate the working of Vidicon camera with neat sketch	4	August 2021
39	Illustrate the working of CCD with neat sketch.	5	August 2021
40	What are the important functions of a machine vision system?	5	August 2021
41	Explain how thresholding is used for segmentation in industrial vision applications	6	August 2021
42	Explain the different methods for braking DC motor	7	December 2021
43	Explain on Light based range finder	6	December 2021
44	Explain the working of a Harmonic Drive	6	December 2021
45	What are the applications and advantages of stepper motor	5	December 2021
46	Using a block diagram, explain DC Servomotor system	5	December 2021
47	Explain the working of a Vidicon Camera	4	December 2021
48	Explain the Histogram image processing technique	7	December 2021

49	Define the terms ‘Region growing’ and ‘Edge detection’ in image processing techniques	4	December 2021
50	Write on the Robotic vision system applications	5	December 2021
51	Explain any one method used for speed control with feedback in brush-type DC motors.	5	June 2022
52	Compare the working of three phase induction motor and three phase synchronous motor.	7	June 2022
53	Explain the three functions of robotic vision system	5	June 2022
54	Explain the thresholding technique in image processing	7	June 2022
55	Illustrate the working of a vidicon camera	6	June 2022
56	Explain the direct time delay measurement and indirect amplitude modulation technique used in light based range finders.	6	June 2022
57	Describe the working of any one type of a force sensor	4	June 2022
58	What are the different methods for speed control in DC Motor	5	January 2023
59	Explain the working of an Ultrasonic range finder	7	January 2023
60	Explain the construction & working of a synchronous motor	5	January 2023
61	Explain the working of a variable reluctance type of stepper motor	5	January 2023
62	Explain the Triangulation method for range measurement	5	January 2023
63	Explain the working of the three types of DC motors	4	January 2023
64	Explain the working of a CCD Camera	4	January 2023
65	Explain on the image processing technique (i) Segmentation (ii) Thresholding	5	January 2023
66	Explain how an information is retrieved from a bar code using a bar code reader	4	January 2023
67	Explain the basic elements of an Automotive control systems	6	January 2023

CODE: MET476	COURSE NAME: CRYOGENIC ENGINEERING		
Q.No	**Module I**	**Marks**	**Month & Year**
1	Distinguish between Ortho and Para hydrogen.	3	January 2023
2	Describe with neat sketches the Phase diagram of Helium-4.	4	January 2023
3	Distinguish between Type I and Type II Super conductors. Explain	3	January 2023
4	Describe Meissner effect? Mention its application in cryogenics	3	January 2023
5	Describe in detail the variation of thermal properties of various materials at cryogenic temperatures.	5	June 2022
6	Explain the applications of cryogenics in space technology.	3	June 2022
7	Explain the behaviour of electrical and magnetic properties of materials at cryogenic temperature.	6	December 2021
8	Explain the historical background of cryogenics.	5	December 2021
9	Explain the application of cryogenics in the food processing industry.	5	December 2021
10	Discuss the role of cryogenics in i) Biology and medicine ii) Food industry	3	December 2021
Q.No	**Module II**	**Marks**	**Month & Year**
1	Write short notes on Joule Thompson coefficient and Inversion curve. Also explain the significance of Joule Thompson coefficient in gas liquefaction systems.	5	January 2023
2	Describe with sketches the working principle of Simple Linde Hampson gas liquefaction system	4	January 2023
3	Derive the equation for liquid yield and work per unit mass of gas compressed in a Simple Linde Hampson gas liquefaction system.	6	January 2023
4	Sketch and explain the working of a precooled Linde Hampson system for the liquefaction of hydrogen gas.	6	June 2022
5	With a neat schematic and temperature entropy diagram, explain the working of Claude liquefaction system.	6	June 2022
6	Describe the advantages and limitations of simple Linde Hampson cycle?	4	June 2022
7	Explain the working of an ideal gas liquefaction system and hence derive the expression for the liquid yield	5	December 2021
8	Explain the working of Claude liquefaction system with neat sketch and derive the expression for liquid yield.	5	December 2021
9	Discuss the importance of inversion temperature in liquefaction of gases.	3	December 2021
10	With a neat sketch explain the working of a cascade liquefaction system for nitrogen	7	December 2021

Q.No	Module III	Marks	Month & Year
1	Name any four types of heat exchanger configurations used in cryogenic gas liquefaction systems.	4	January 2023
2	Describe with neat sketches the working of a Carnot Refrigerator and derive its COP	8	January 2023
3	With neat sketches explain the working of Gifford Mc-Mahon Cryocooler.	8	January 2023
4	With the help of schematic and T-S diagram, explain the working of a Philips Refrigerator	6	June 2022
5	With a neat sketch and T-S diagram explain the working of a magnetic refrigeration system	6	June 2022
6	With a neat sketch and T-s diagram explain the working of Collins helium liquefaction system	10	December 2021
7	Draw the schematic and T-s diagram and explain the working of the Simon helium liquefaction system.	10	December 2021
8	Explain the significance of regenerators in a Philips refrigerator	4	December 2021
9	Describe adiabatic demagnetization process. With the help of a schematic and T-s diagram explain the working of a magnetic refrigerator.	10	December 2021
Q.No	**Module IV**	**Marks**	**Month & Year**
1	With the help of neat sketch explain the various components in a Dewar vessel.	10	January 2023
2	Compare the advantages and disadvantages of different types of insulations used in cryogenic systems	10	January 2023
3	Explain any two cryogenic fluid transfer systems used in test sites of the space programs	10	January 2023
4	Explain the importance of insulation in cryogenics and the different types.	8	June 2022
5	Explain (i) cryopumping and (ii) cryopump.	5	June 2022
6	Write notes on the various cryogenic valves used in transfer lines	5	December 2021
7	With a neat diagram explain the suspension system, safety devices and fill and drain system of a typical cryogenic storage vessel.	10	December 2021
Q.No	**Module V**	**Marks**	**Month & Year**
1	Explain about any two flow measuring devices used in Cryogenic fluid flow systems.	10	January 2023
2	Explain about any two liquid level measuring devices used in the cryogenic fluid storage vessels with the help of neat sketches.	10	January 2023
3	With a neat sketch explain the working of a platinum resistance thermometer.	10	June 2022
4	Illustrate the working of a capacitance type liquid level gauge	7	June 2022

5	Illustrate the working of a constant volume gas thermometer?	5	June 2022
6	Explain the constructional features of venturimeter used for the cryogenic fluid flow measurement.	6	December 2021
7	Explain the working principle of magnetic thermometer.	4	December 2021
8	Explain the working of a turbine type flow meter	5	December 2021
9	Explain the working of any one pressure measurement system used in cryogenic applications	5	December 2021

QUESTION BANK

MET 424 INDUSTRIAL HYDRAULICS

MODULE 1

1	Define Pascal's Law and its application	3 marks	KTU July 2020
2	Explain any 3 properties of Fluids	3 marks	KTU July 2021
3	Explain how the variation in temperature and pressure affect the Hydraulic fluids	5 marks	KTU Dec 2019
4	Compare Hydraulic system with Pneumatic system and list the advantages of Hydraulic system over the pneumatic system	5 marks	KTU Dec 2019
5	List the properties of an ideal Hydraulic fluid	5 marks	KTU Dec 2019
6	List any 4 additives used in a hydraulic system	5 marks	KTU July 2021
7	Differentiate between viscosity and viscosity index	5marks	KTU July 2021
8	Simple problems using Pascal's Law	5marks	

MODULE II

1	Discuss the importance of Pressure release valve	5marks	KTU Dec 2019
2	Explain the construction and working of a gear pump, vane pump and piston pump	7 marks	KTU Dec 2019
3	Derive the expression for performance of a gear pump, vane pump. Piston pump	14 marks	KTU Dec 2019
4	Discuss the influence of pressure, size and speed on pump noise level	3marks	KTU dec 2021
5	Why can't a gear pump be used as a variable displacement pump	3 marks	KTU Model Question Paper
6	Problems on Pump performance	5 marks	KTU Model

			Question Paper

MODULE III

1	Explain the construction and working of piston type accumulators	5 Marks	KTU Dec 2019
2	Describe a rectangular flat topped reservoir fitted with basic accessories	5 Marks	KTU Dec 2019
3	Why is the actual flow required by a hydraulic motor greater than the theoretical flow	3 marks	KTU Dec 2019
4	Explain the construction and working of a balanced vane motor	5 marks	KTU Dec 2019
5	Describe end cushion provided in hydraulic cylinders	5 marks	KTU July 2021
6	Describe the term degree of filtration	3 marks	KTU July 2021
7	Explain the need for pressurising a reservoir	3 Marks	KTU July 2021

MODULE IV

1	Explain pressure relief valve with a neat sketch	5 Marks	KTU Dec 2019
2	Explain spool type directional control valve used to control double acting cylinder with a neat sketch	5 Marks	KTU Dec 2019
3	Explain servo valve used in hydraulic power steering systems in automobiles with neat sketches	5 marks	KTU July 2021
4	Differentiate between burst pressure and working pressure of conducting lines	5 marks	KTU July 2021
5	Differentiate the operating of a sequencing valve and pressure reducing valve	5 marks	KTU July 2021

6	Describe and draw the symbols of any five actuation methods used for moving the spool direction of control valves	5 marks	KTU July 2021

MODULE V

1	What is meant by meter in and meter out circuits	5 marks	KTU Dec 2019
2	Explain the working of a meter in circuit for controlling the motion of a rotary actuator with a neat diagram	10 marks	KTU Dec 2019
3	Explain the working of a meter out circuit for controlling the speed of a cylinder with a neat diagram	10 Marks	KTU Dec 2019
4	With the help of an appropriate circuit diagram explain rapid traverse and speed control	10 marks	KTU July 2021
5	The table of a surface grinding machine needs automatic reciprocating motion. Draw a hydraulic circuit to achieve this	10 marks	KTU July 2021
6	Similar hydraulic circuit problems	5marks	

MET 478 POWER PLANT ENGINEERING

MODULE 1

1	Comment on the methods used for handling of coal.	3 marks	KTU Model
2	State the advantages and disadvantages of pulverized coal firing.	3 marks	KTU Model
3	Illustrate and explain the functions of cooling tower.	3 marks	KTU Model
4	Define drift? How drift is eliminated in cooling towers?	3 Marks	KTU Model
5	Comment on the types of burner employed for pulverized coals in the thermal power plants.	7marks	KTU Model
6	Explain the analysis of pollution from thermal power plants.	7marks	KTU Model
7	How ash is handled in the power plant? Explain the ash handling system.	7 marks	KTU Model
8	Explain the principle involved in preparation of coal and what are the methods of preparation?	7 marks	KTU Model
9	Illustrate and explain the working different types of cooling towers.	7 marks	
10	Explain with neat diagrams about the improvisations provided to Rankine cycle for increasing efficiency.	7marks	
11	Explain with the help of necessary diagrams about Fluidized Bed Combustion Boilers (FBC Boilers).	7marks	
12	What is the necessity of feed water treatment in thermal power plant?		JNTUK
13	Write advantages of mechanical coal handling systems.	4 Marks	JNTUK
14	Distinguish between forced draught and induced draught cooling towers.	8 Marks	JNTUK
15	What are advantages of pulverized fuel firing system?	4 Marks	JNTUK
16	What are the methods available for feed water treatment, explain them briefly?	8 Marks	JNTUK
17	Explain the principle of operation of underfeed stoker	4 Marks	JNTUK
18	What are belt conveyors and what are its advantages and limitations?	8 Marks	JNTUK
19	Briefly explain Fluidized Bed Combustion (FBC)		CUSAT
20	What are the different types of steam condensers? Give a brief description on evaporative type of condensers	7 Marks	
21	Explain in detail about mechanical dust collector and Electrostatic Precipitator. Why both are used over a single unit in modern power plants.	13 Marks	
22	Mention any four equipment used for ash collection	2 Marks	
23	Explain the construction and working principle of super critical	7 Marks	

	Boilers with suitable sketch		

MODULE II

1	State the applications of diesel electric power plants.	3 marks	KTU Model
2	List the components present in the diesel electric power plants.	7 marks	KTU Model
3	Illustrate and explain working of a regenerative gas turbine and re-heater with a help of a P-V diagram.	7 marks	KTU Model
4	What are the methods of cooling in a diesel engine power plant?	3marks	KTU Model
5	List out the difference between open cycle and closed cycle gas turbine plant.	3 marks	KTU Model
6	Give the layout of diesel engine power plant. What are the advantages and disadvantages of diesel power plants?	7 marks	KTU Model
7	What are the methods used for improving the efficiency of a gas turbine plant?	14 marks	
8	Discuss briefly with schematic diagram, integration of gas turbine plant with steam power plant.	8 Marks	JNTU
9	What are the discrete advantages of combined operation power plants?	8 Marks	JNTU
10	What factors should be considered while selecting a site for diesel power plant?	5 Marks	CUSAT
11	Enumerate the merits of closed cycle gas turbine cycle over open cycle gas turbine	5 Marks	CUSAT
12	What is the purpose of surge tank?	2 marks	STUCOR
13	Explain the integrated gasifier based combined cycle system	6 Marks	
14	Write a note on fuel system of diesel power plant	7 Marks	
15	Explain briefly on binary vapour cycle with a neat sketch.	5 Marks	

MODULE III

1	Mention the advantages of nuclear power plant.	3 Marks	KTU Model
2	Define “half-life” of nuclear fuels.	3 Marks	KTU Model
3	Describe the functionality of moderator	3 marks	KTU Model
4	Explain with neat sketches and with examples difference between controlled and uncontrolled chain reaction?	7 marks	KTU Model
5	Describe the boiling water reactor with the help of neat sketch and explain its chief characteristics	7 marks	KTU Model
6	Explain the working of a typical fast breeder nuclear reactor power plant, with the help of neat diagram.	7 marks	KTU Model
7	Define commonly used methods of nuclear waste disposal and	7 Marks	KTU Model

	discuss their salient features.		
8	Explain the factors to be considered while selecting the site of a hydro power plant?	7 Marks	KTU Model
9	Explain the construction and working of Geo thermal power plant	7 Marks	KTU Model
10	What are the desirable properties of coolants used in nuclear reactor?	3 marks	KTU Model
11	What are the different moderators used in a nuclear power plant. What properties make them suitable as moderators	8 Marks	JNTU
12	What are nuclear wastes and how it can be handled?	8 Marks	
13	Enumerate an)i six desirable characteristics of a nuclear coolant		CUSAT
14	Give a detailed explanation of liquid metal cooled nuclear reactors.	7 Marks	
15	Explain BWR and PWR in a nuclear power plant.	5 Marks	CUSAT
16	Name the coolants used for fast breeder reactor.		
17	Explain the pollution control technologies including waste disposal option for nuclear power plant.	5 Marks	
18	Mention any four ways of Nuclear power plant safety	4 Marks	
19	Outline the construction and working principle of Heavy water Cooled Reactor (HWR) with a neat sketch and discuss the advantages and disadvantages of HWR.	7 Marks	

MODULE IV

1	Comment on the working of a solar cell.	3Marks	KTU Model
2	What are the advantages and limitations of tidal power plant?	3Marks	KTU Model
3	Explain in detail about the various types of Wind energy system	7marks	KTU Model
4	Explain with a neat diagram of wind electric generating power plant.	7 marks	KTU Model
5	Explain briefly how turbines are classified in hydroelectric plant.	8 marks	
6	Give a brief explanation of solar pond technology.	7 Marks	
7	Give a brief account of any two types of wind turbines	7 Marks	
8	Explain about the types of solar energy collectors.	7 Marks	
9	Explain about the types of dams with necessary diagrams.	7 Marks	
10	Explain the necessity of spillway in dams. Also classify based on flow.	7 Marks	
11	Discuss the main components and working principle of wind-Electric generating power plant with neat sketch and explain the different types of wind Machines.	14 Marks	
12	Explain the principle of working and construction of solar power plant using suitable sketches. State their advantages, disadvantages and applications	14 Marks	
13	Describe with neat sketch the working of solar photo voltaic cell	7 Marks	

14	Explain the advantages and disadvantages of wind energy system.	4 Marks	

MODULE V

1	Define the importance of capital cost in a power plant.	3 Marks	
2	Define load factor and list out methods for improvement in load factor	3 Marks	
3	A central power station has annual factors as follows: Load factor = 60%, Capacity factor= 40%, Use factor = 45%, Power station has a maximum demand of 15,000 kW. Determine: Annual energy production, Reserve capacity over and above peak load, Hours per year not in service.	7 Marks	
4	What are the elements which contribute to the cost of the electricity? How can the cost power generation be reduced?	7 marks	
5	Define power plant economics? Explain the fixed and operating cost of a power station.	7 marks	
6	Discuss briefly the methods to reduce power generation costs	8 Marks	
7	Define Demand Factor and Load Factor of a power plant.		CUSAT
8	Briefly explain various costs elements to form total cost of a System.		CUSAT
9	A generating station supplies the following loads: I5 MW, 12 MW, 8,5 MW, 5 MW and 0.45 MW. The station has a maximum demand of 22 Mw. The annual load factor is 0.48. Calculate (i) The diversity factor and (ii) The demand factor.	5 Marks	CUSAT
10	Define the terms i)Load curve ii)Load duration curve iii) Maximum demand iv) factor Diversity factor Load factor	7 Marks	
11	What are the different methods used to calculate depreciation cost of power plant?	2 Marks	
12	What is particulate emission?	2 Marks	
13	What is a tariff? Discuss and compare various tariff used in practice.	7 Marks	
14	list the various initial cost of a power station		
15	A new factory having a minimum demand of 100 kw and a load factor of 25% is comparing two power supply agencies. i) Public supply tariff is Rs. 40 per kw of maximum demand plus 2 paise per kwh. Capital cost = Rs. 70,000 Interest and depreciation = 10% ii) Private oil engine generating station. Capital cost = Rs. 2,50,000	14 Marks	

	Fuel consumption = 0.3 kg per kwh Cost of fuel = Rs. 70 per tonne wages = 0.4 paise per kwh Maintenance cost = 0.3 paise per kwh Interest and depreciation = 15%		

Course Code: ME403

Course Name: ADVANCED ENERGY ENGINEERING

MODULE 1

1	Explain the importance of renewable energy resources in India's power requirement context.	6	KTU August 2021
2	List any four advantages and disadvantages of hydro electric power plant.	4	KTU August 2021
3	Explain the components, layout and working principle of a nuclear power plant.	10	KTU August 2021
4	Elaborate on the future demand of fossil fuels as conventional energy source.	5	KTU December 2021
5	With the help of a schematic explain the components of a nuclear power plant.	5	KTU December 2021
6	List the advantages and disadvantages of a hydro power plant over thermal power plant.	4	KTU December 2021
7	Explain about the construction and working of a hydro power plant with the help of a neat layout.	6	KTU December 2021
8	List major five renewable sources of energy. What is the significance of renewable sources on current global energy demand?	6	KTU June 2022
9	What is regeneration in steam power plant?	4	KTU June 2022
10	Sketch the layout of a steam power plant. Explain the various circuits in a stem power plant	6	KTU June 2022
11	What is a surge tank and why it is used in hydal power plants?	4	KTU June 2022

MODULE II

1	Explain different types of solar collectors with sketches.	6	KTU August 2021
2	Describe the working of a passive solar energy system with a simple figure.	4	KTU August 2021
3	With neat diagram, explain the components of a solar power tower.	6	KTU August 2021

4	What are the major classifications of solar energy conversion systems?	4	KTU August 2021
5	Explain components and layout of solar wind hybrid energy system.	6	KTU August 2021
6	Compare the vertical axis wind turbines with horizontal axis wind turbines.	4	KTU August 2021
7	Explain the working principle and construction of vertical axis wind turbine with sketches.	6	KTU August 2021
8	List four advantages and limitations of wind energy system.	4	KTU August 2021
9	With the help of a neat sketch, explain the working and construction of central receiver type solar thermal electric power plant with heliostat.	10	KTU December 2021
10	With a neat sketch explain the working of solar flat plate collectors.	7	KTU December 2021
11	List the different types of focussing type solar collectors.	3	KTU December 2021
12	With a neat schematic show the construction of a horizontal axis wind energy conversion system and explain its working.	6	KTU December 2021
13	Elaborate on the construction and working of the different types of vertical axis wind mills with sketches.	10	KTU December 2021
14	What are the benefits of solar energy?	5	KTU June 2022
15	With a neat sketch explain flat plate solar collector.	5	KTU June 2022
16	How do solar photovoltaic (PV) panels work?	6	KTU June 2022
17	Compare between mono-crystalline & poly-crystalline solar panel.	4	KTU June 2022
18	What are the basic components of a wind turbine?	6	KTU June 2022
19	How wind energy is converted to electricity in a wind turbine?	4	KTU June 2022
20	With a neat sketch differentiate between an up-wind and downwind machines.	3	KTU June 2022
21	What is active yaw control in wind turbine?	3	KTU June 2022

22	What is meant by a turbine's swept area?	4	KTU June 2022

MODULE III

1	Explain any two types of thermo-chemical conversion process of biomass to energy.	6	KTU August 2021
2	Describe the steps involved in alcoholic fermentation process with a process flow chart.	4	KTU August 2021
3	Explain the steps involved in preparation of bio diesel from jatropha with a process flow chart.	6	KTU August 2021
4	Describe any one type of bio gas plant with a neat sketch.	4	KTU August 2021
5	Explain the construction and working of Janta (non-floating type) bio gas plant with the help of a neat sketch.	6	KTU December 2021
6	Discuss briefly about the different steps involved in the conversion of biomass to biogas in a digester.	4	KTU December 2021
7	Explain any one method of bio-chemical conversion of biomass.	5	KTU December 2021
8	Discuss briefly about the trans-esterification process.	3	KTU December 2021
9	Distinguish between pyrolysis and gasification process.	2	KTU December 2021
10	Explain the different bio-chemical conversion of biomass	6	KTU June 2022
11	What is pyrolysis of biomass?	4	KTU June 2022
12	Explain the process of transesterification	4	KTU June 2022
13	With a neat sketch explain the working of fixed dome type digester biogas plant	6	KTU June 2022

MODULE IV

1	Explain any two types of tidal energy harvesting technologies with sketches.	6	KTU August 2021
2	List out advantages and disadvantages of geothermal energy.	4	KTU August 2021
3	Explain components and working principle of MHD power generation with alayout.	6	KTU August 2021

4	Describe working principle and parts of a fuel cell.	4	KTU August 2021
5	Explain the components and working principle of wind-diesel type of hybrid power plant with a layout.	6	KTU August 2021
6	List the advantages and disadvantages of wave energy.	4	KTU August 2021
7	With a neat sketch explain the working of a vapour dominated geothermal power plant.	7	KTU December 2021
8	What are the advantages of mini and micro hydro power plants over conventional hydro power plants?	3	KTU December 2021
9	With a neat sketch explain the working of a Magneto Hydro Dynamic power generation unit.	6	KTU December 2021
10	List out the various applications of fuel cells.	4	KTU December 2021
11	Explain the different methods to store hydrogen for the energy conversion process.	3	KTU December 2021
12	With the help of a neat sketch, explain the construction and working of a geothermal fossil hybrid power plant.	7	KTU December 2021
13	What is geothermal power?	3	KTU June 2022
14	Explain with a neat sketch the working of Flashed steam Hydrothermal system	7	KTU June 2022
15	What are the basic components of a tidal power plant?	3	KTU June 2022
16	With a neat sketch explain the working of Double basin tidal power plant	7	KTU June 2022
17	How magneto hydro dynamic generators works?	3	KTU June 2022
18	With a neat sketch explain the operation of Open cycle MHD system	7	KTU June 2022

MODULE V

1	Explain any six causes for the loss of biodiversity.	6	KTU August 2021
2	What are the various steps to be taken to control ozone layer depletion?	4	KTU August 2021
3	Describe the causes and effects of global warming.	6	KTU August 2021
4	List out the environmental impact of hydel power plants.	4	KTU August 2021
5	Describe the wastewater treatment process with neat sketches.	6	KTU August 2021

6	List out the solutions to reduce eutrophication.	4	KTU August 2021
7	List out a few of the primary sources of air pollution and the different methods used to control it.	7	KTU December 2021
8	Explain the phenomenon of thermal pollution.	3	KTU December 2021
9	Describe any wastewater treatment process with neat sketches.	6	KTU December 2021
10	Explain the phenomenon of the greenhouse effect.	4	KTU December 2021
11	Explain briefly about the conditions which will lead to acid rain and also the harmful effects of acid rain.	7	KTU December 2021
11	List any three sources of land degradation.	3	KTU December 2021
12	How the growing consumption of fossil fuels leads to global warming?	5	KTU June 2022
13	What are the causes and effects of ozone layer depletion?	5	KTU June 2022
14	How renewable energies help on sustainable development in the context of current global energy demand?	5	KTU June 2022
15	Briefly explain any four air pollutants and their effects	5	KTU June 2022
16	What are the causes land degradation?	5	KTU June 2022
17	Explain the measures taken to control thermal pollution.	5	KTU June 2022