

ME-1871/1773
Examination –Nov- 2022
B.Tech. VII Sem: Mechanical Engineering
Refrigeration & Air Conditioning

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

Use of psychrometric and refrigeration charts and tables are allowed.

- Q.1 (a) How second law of thermodynamics helpful in principle of producing refrigeration. 02
 (b) Write a short note on history of refrigeration 02
 (c) What are the different types of refrigeration system? 03
 (d) An aircraft refrigeration plant has a capacity of 30 TR. The ambient temperature is 17 C and air is compressed to 0.95 bar and 30 C due to ramming and further compressed to 4.75 bar and then cooled to 67 C in a heat exchanger. It then expanded in a turbine to 1 bar before it is supplied to the cabin at 27 C. The isentropic efficiency of the compressor and turbine is 0.9. Determine (a) Mass flow rate per second (b)COP (c)specific power required 07
 Take $C_p = 1.004 \text{Kj/Kg C}$ $\gamma = 1.4$ for air

OR

Discuss applicability of Carnot cycle for air refrigeration system and show that carnot efficiency depends on the lowest and the highest temperature of the cycle 07

- Q.2 (a) How actual vapor compression cycle differs from theoretical cycle. Show the difference on PH/TS chart. 02
 (b) Why multi compression and expansion is required. 02
 (c) What is dry ice? How it is produced. 03
 (d) A refrigeration plant works between temperature limit of -5 C and 25 C. The refrigerant CO₂ is wet at the entry to compressor with a dryness fraction of 0.6. The refrigerator has actual COP 70% of theoretical COP. If there is no undercooling determine the amount of ice produced in in 24 hour with water at 20 C. The mass of CO₂ circulated is 5Kg/min. Take enthalpy of fusion of ice as 336Kj/Kg. 07

Saturation Temp C	Specific enthalpy Kj/Kg (Hf)	Specific enthalpy F _g /Kg (Hg)	Specific entropy Kj/Kg-K (Sf)
25	81.25	202.75	0.2513
-5	-7.53	238.5	-0.04187

OR

A refrigeration system R22 produces a refrigeration effect of 1TR. The evaporator is at 10 C and 3.5 bar and condenser temperature is 40 C and pressure is 15.3 bar. The compressor outlet pressure measured to be 18.5 bar. With no pressure loss on evaporator side and assuming saturated cycle evaluate refrigeration effect, mass flow rate, COP.

- Q.3 (a) What is desiccant cooling? 02
(b) Give examples of refrigerant mixtures that are used in refrigeration application. 02
(c) Discuss the cycle of operation of steam jet refrigeration system 03
(d) Compare absorption refrigeration and vapor refrigeration system on operation, performance, application and construction. 07

OR

What are the refrigerants that impact our environment and how. What are the alternative refrigerants that are environment friendly? 07

- Q.4 (a) Name all the psychrometric properties that are represented on psychrometric chart. Show with the help of the chart. 02
(b) Name and show all the psychrometric process on a psychrometric chart with direction. 02
(c) Total enthalpy of the atmospheric air is a function of WBT. Discuss and justify 03
(d) 300 cubic meter/min of moist air enters a refrigeration coil at 35 C DBT and 50% RH. The ADP of the coil is 10 C and bypass factor is 0.15; determine the outlet status of the air and cooling capacity of the coil. 07

OR

500 cubic meter of air at 30 C DBT and 50% RH is adiabatically mixed with 1000 cubic meter of recirculated air at 22 C DBT and 10 C DPT. Calculate the enthalpy specific volume humidity ratio and final DBT of the mixture. 07

- Q.5 (a) What are the factors that affects bypass factor of a cooling/heating coil. 02
(b) What is sensible heat factor and its significance in psychrometry. 02
(c) What are the factors that affect human comfort parameters? 03
(d) A hall is to be maintained at 24 C and 60% RH under the following conditions. 07

Outdoor conditions 38 C DBT and 28 C WBT

Room sensible heat load 46.4 KW and latent heat load 11.6KW

Quantity of infiltration 1200 cubic meter/hour ADP 10 C

Quantity of air re circulated 60%

If the mixing is done after the cooling coil determine condition of air leaving the cooling coil, condition of air entering the hall, bypass factor and refrigeration load.

OR

A room is to be maintained at 26 C DBT and 19 C WBT whereas outdoor conditions are 35 C DBT and 27 WBT. Room heat gains are 11.1 KW sensible and 3.9 KW latent heat. The conditioned air supplied to the room 50 cmm with 75% re circulated and 25% fresh air. Determine DBT and WBT 07

ME-1872(A)/1771
Examination –Nov.- 2022
B.Tech. VII Sem : Mechanical Engineering
Machine Design - II

Max. Marks : 70

Min. Marks : 22

Time : 3 Hrs

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) Enumerate various important factors upon which the selection of a belt drive depends. 02
- (b) Draw the generalised graph showing the belt tension along the different locations of belt drive. 02
- (c) Discuss different types of belts and their material used for power transmission. 03
- (d) Write the design procedure for the chain drive. 07

OR

A leather belt 9mm x 250mm is used to drive a cast iron pulley 900 mm in diameter at 380 RPM. If the active arc on the smaller pulley is 120 degree and the stress in tight side is 3 MPa, find the power capacity of the belt. The density of the leather may be taken as 980 Kg/cubic meter, and coefficient of friction of leather on cast iron is 0.35. 07

- Q.2 (a) Classify the gears on the basis of relative position of shafts. 02
- (b) State two reasons for adopting involute curves for a gear tooth profile. 02
- (c) Suggest possible remedies to avoid Gear Tooth Failure. 03
- (d) Derive the Lewis equation for beam strength of gear tooth and explain the need of Buckingham's equation of incremental dynamic load to account for the dynamic effects in gear design? 07

OR

It is required to design a pair of spur gears with 20° full-depth involute teeth based on Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to 10 kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4 :1. The pinion as well as the gear is made of plain carbon steel 40C8 (Sut = 600 N/mm²). The factor of safety can be taken as 1.5. Design the gear to specify the module. Assume Lewis form factor as 0.308. 07

- Q.3 (a) Why grey cast iron is a preferred material for manufacturing of engine cylinder? 02
- (b) What are the design considerations of piston in an I.C. engine? 02

- (c) Explain the effect of whipping stress in connecting rod of an I.C engine.
- (d) Enumerate how the thickness of piston head is calculated using two design criteria.

OR

The cylinder of a four-stroke diesel engine has the following specifications:

Brake power = 3.75 kW, Speed = 1000 rpm Indicated mean effective pressure = .35MPa
Mechanical efficiency = 80% . Determine the bore and length of the cylinder liner, if stroke length to cylinder diameter is 1.5

- Q.4 (a) Write a short note to differentiate between rigid and flexible coupling.
- (b) What are the advantages and disadvantages of sleeve or muff coupling?
- (c) What assumptions are made for the analysis of thin Cylindrical shell?
- (d) Explain the stress distribution pattern in thick cylindrical shell subjected to an internal pressure.

OR

An air receiver consisting of a cylinder closed by hemispherical ends. It has a storage capacity of 0.25 m^3 and an operating internal pressure of 5 MPa. It is made of plain carbon steel 10C4 ($S_{ut} = 340 \text{ N/mm}^2$) and the factor of safety is 4. Neglecting the effect of welded joints, determine the dimensions of receiver, if internal diameter is D_i and length is twice of internal diameter.

- Q.5 (a) How an optimum design is different from adequate design? 02
- (b) Write the applications of optimization in engineering. 02
- (c) Describe the following terms used for the formulation of an optimization problem: 03
(i) Design vector, (ii) Design constraints, and (iii) Objective function
- (d) How optimization problems are classified and what are different techniques of design optimization. 07

OR

Explain anyone of the given techniques of design optimization:

- (i) Lagrange multiplier method, 07
- (ii) Linear programming by graphical method.

ME-1872(C)
Examination –Nov- 2022
B.Tech. VII Sem: Mechanical Engineering
Product Design & Development

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) What are the various factors of product design? 02
 (b) What are the disadvantages of evolutionary design? 02
 (c) Explain the terms: Process Capability, Allowances and Tolerance. 03
 (d) Explain the seven phases of morphology of design? 07

OR

Explain the main features of Production Consumption Cycle with diagram? 07

- Q.2 (a) What is meant by 'Standardization' in design? 02
 (b) List the various product design strategies. 02
 (c) What are the main factors to be analyzed in product design? 03
 (d) Explain the following strategies used by product designers in 'functional design practice. 07
 (i) Biasing (ii) cascading (iii) regeneration (iv) avoidance of redundancy
 (v) compatibility. Give suitable examples.

OR

Explain how a design is communicated by the designer to head of the design group? 07

- Q.3 (a) What is meant by Value? 02
 (b) What are the various steps of value analysis tests? 02
 (c) What is creativity and write the various creative techniques? 03
 (d) What is a profit volume chart? Sketch a profit volume chart showing profit(P), break-even quantity Q, fixed cost (F), slope (b-a) of the (P/v) line. 07

OR

Explain in brief the value engineering idea generation checklist according to morphological approach? 07

- Q.4 (a) What are the four phases of launch cycle?
(b) What is meant by commercialization?
(c) Explain the new product development process according to Booz, Allen and Hamilton?
(d) Explain in brief the various stages of product life cycle with different strategies?

OR

How is a product defined by concentric circles? Explain: 1. Core benefit, 2. Generic product, 3. Expected product, 4. Augmented product, 5. Potential Product

- Q.5 (a) What is the concept of Design for Environment?
(b) What are the three compelling factors of design for environment?
(c) What are the objectives of DFE as laid down by CERES.
(d) What is meant by life cycle assessment? Explain with a block diagram the components of life cycle assessment of product.

OR

Explain the various techniques to reduce environmental impact?

ME-1873 (B)
Examination –Nov- 2022
B.Tech. VII Sem: Mechanical Engineering
Non Conventional Energy Sources

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) Define Global Warming? 02
 (b) What is necessity of energy storage? 02
 (c) Explain various energy storage methods? 03
 (d) What are unconventional and un-conventional energy sources? Describe briefly? 07
- OR**
- What is meant by renewable energy sources? What are advantage and limitations of renewable sources? 07
- Q.2 (a) Define solar constant? 02
 (b) Explain Beam and Diffuse radiation? 02
 (c) Define the term Altitude angle, Incident angle, Zenith angle? 03
 (d) What are main components of a flat plate solar collector? Explain the functions of each? 07
- OR**
- Explain with neat sketch the solar cooker and Solar refrigeration & air conditioning? 07
- Q.3 (a) Define Solar cell? 02
 (b) What do you understand the Photo Voltaic technology?? 02
 (c) How can you classify solar cell? 03
 (d) Explain the major factors influencing the electrical design of solar array? 07
- OR**
- Explain the various types of solar PV power systems with neat sketch? 07
- Q.4 (a) Describe main applications of wind energy? 02
 (b) What is the basic principle of wind energy conversion? 02
 (c) What is fuel cell? Describe the principle of working of a fuel cell? 03
 (d) Describe the main considerations in selecting a site for wind generators? 07
- OR**
- Explain various types of wind turbines and their construction? 07

- Q.5 (a) How biomass conversion takes place?
(b) What is difference between biomass and biogas
(c) Explain in brief the ocean and geothermal energy applications?
(d) Explain the process "photosynthesis"? What are the conditions which are necessary for it?

OR

How are Gasifiers classified? What are the potential applications of gasifier?

ME-1874
Examination –Nov.- 2022
B.Tech. VII Sem : Mechanical Engineering
MIS and ERP

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) What are objectives and benefits of MIS? 02
 (b) Explain the obstacles and challenges of MIS. 02
 (c) Enumerate the structured and unstructured decision. 03
 (d) How can MIS will be used as strategic tool in an organization? 07

OR

What is the significance of Value chain & MIS support? 07

- Q.2 (a) Define System and explain its characteristics. 02
 (b) What is pull and push control? 02
 (c) Explain work system model and compare it with other model. 03
 (d) How the Law of Requisite Variety is used in decision making and in the MIS? 07

OR

Explain the concept of entropy used in system control. How would you use this concept in MIS? 07

- Q.3 (a) What do you know about SDLC? 02
 (b) How planning and control concepts helps in managing information systems? 02
 (c) What do you know about control and maintenance of information system? 03
 (d) How can sensitivity analysis aid in identifying the value of more information? 07

OR

Describe the Newell-Simon model of the human as an information processor. 07

- Q.4 (a) Why ERP evolution took place? 02

- Total
- (b) What is the significance and functions of BPR? 07
 - (c) Enumerate some reasons for ERP failure.
 - (d) What are the different types of strategies used by companies to organize their ERP projects? 07

OR

How can ERP improves a company's business performances? 07

- Q.5
- (a) What are the characteristics of ERP? 02
 - (b) What is the role of ERP consultant? 02
 - (c) Describe briefly about some of the ERP Module. 03
 - (d) Explain the methodology of ERP implementation. 07

OR

Propose an ERP plan for our institute. Which strategy will be most suitable for its implementation? 07

ME-1875
Examination –Nov- 2022
B.Tech. VII Sem: Mechanical Engineering
Industrial Automation

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) What is the threat due to safety issues in automobile industry? 02
- (b) What are the challenges that Remote repair, diagnostics, and maintenance work usually face? 02
- (c) How Robots Benefit Food and Beverage Manufacturers 03
- (d) Analyze the Industrial Automation Principle followed in process industry. 07

OR

Analyze the Automation strategies for an automotive industry. 07

- Q.2 (a) Explain the Major Objectives of Conveyor Application? 02
- (b) Analyze the basic Elements of fully automated material handling System 02
- (c) How material handling labor ratio and storage space utilization ratio affects the productivity. 03
- (d) Analyze the different cargo handling equipment used at PORTS. 07

OR

How to Select and Optimize Cost-Effective Material Handling Systems in Industry 4.0? 07

- Q.3 (a) What is Automatic Identification and Data Capture (AIDC) in Industry 4? 02
- (b) Write AIDC benefits in Industry 4.0. 02
- (c) Write a note on radio frequency identification (RFID) tags and readers. 03
- (d) Analyze benefits of Electronic Article Surveillance and Optical Character Recognition? 07

OR

Analyze different types of AIDC technology and equipment. 07

- Q.4 (a) Explain Five Levels in Industrial Automation.
(b) What are two dimensional barcode symbology?
(c) Analyze the difference between PLC and HMI.
(d) Write a note on SCADA, and what are its applications in automotive industries?

OR

Analyze different industrial control systems.

- Q.5 (a) How a Simulation/digital twins can use to identify a specific malfunctioning par.
(b) Explain 6 benefits of Machine Learning in Manufacturing.
(c) What is Big Data and AI analytics in logistics and SCM?
(d) Analyze how Industrial Internet of Things (IIoT) helps in designing and modify products?

OR

Analyze "Cloud computing is the "great enabler" of Industry 4.0 and digital transformation.

ME-1782
Examination –Nov.- 2022
B.Tech. VIII Sem : Mechanical Engineering
Power Plant Engineering

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) What are primary & Secondary energy source? 02
 (b) Enumerate the major sources of energy? 02
 (c) What are methods of converting various energy sources to electric energy? 03
 (d) Explain MHD-Converter with neat sketch 07
- OR**
- Discuss the method of tidal energy conversion. Enlist its merit and demerits 07
- Q.2 (a) What are steam condensers? 02
 (b) Describe coal handling system in thermal power plant? 02
 (c) Explain Dry and wet type cooling towers 03
 (d) Write the criteria for selection of location for thermal power plant. Draw plant layout. 07
- OR**
- Discuss the need of feed water treatment in thermal power plant. Describe few methods used for this 07
- Q.3 (a) Explain Radioactivity hazards 02
 (b) Define moderator and reflector 02
 (c) Explain in brief the control rods in Nuclear power plants 03
 (d) Explain the basic principles of development of nuclear energy through fission and fusion reactions? 07
- OR**
- Describe cladding in nuclear reactors. Describe the properties of three cladding materials? 07
- Q.4 (a) Define Hydrological cycle? 02
 (b) What is the function of draft tube? 02
 (c) Write short notes on selection of hydraulic turbines 03

(d) Discuss the function of penstocks and pressure tunnels used in hydel power stations? 07

OR

Describe the typical layout of hydro power plant? Explain in brief its elements? 07

- Q.5 (a) Explain maximum demand and load factor? 02
(b) Explain Diversity factor and plant factor? 02
(c) Explain the factors affecting the economics of generations and distribution of power 03
(d) Discuss salient features of interconnecting various power stations? 07

OR

Compare Hydro, Steam, and Nuclear Power Plants from plant economics and generation point of view? 07

ME-1881
Examination –Nov.- 2022
B.Tech. VIII Sem : Mechanical Engineering
Additive Manufacturing

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) What is Subtractive Manufacturing? 02
 (b) What is Formative Manufacturing? 02
 (c) How AM is Different than Conventional Manufacturing? 03
 (d) What are the steps of AM Process? 07
- OR**
- What are the current states of Additive Manufacturing in the world? Was it really giving cutting edge to conventional manufacturing? 07
- Q.2 (a) Define Stereo lithography? 02
 (b) Define basic principles of FDM process? 02
 (c) How do you classify AM process? 03
 (d) What are the key differences between various type of AM process? What are benefits and limitations of each one? 07
- OR**
- Write brief description of FDM process with suitable diagram 07
- Q.3 (a) Name of Design tools of AM? 02
 (b) Define Design freedom in AM? 02
 (c) How can you apply LOM process? 03
 (d) Define part orientation in AM process 07
- OR**
- Explain DFMA concepts? 07
- Q.4 (a) Write some AM applications? 02

- (b) What are some new materials developed for AM process? 02
- (c) Explain Rapid tooling? 03
- (d) Describe briefly the application of AM in medical 07

OR

What is typical AM application in general engineering? Briefly describe and illustrate them with examples? 07

- Q.5 (a) What are post processing activities in AM process? 02
- (b) How support material removal takes place in AM process? 02
- (c) How aesthetic improvement can be done in AM products? 03
- (d) Write a note on future directions of AM parts? 07

OR

Explain Thermal and non thermal techniques for property enhancements of AM? 07
