1341 **Code : 15ME53T**

Register Number | | | | | | | |

V Semester Diploma Examination, April/May-2018

MACHINE DESIGN

Time : 3 Hours] **[Max. Marks : 100**

Note : (i) Answer **all** questions
(ii) Use of design data hand book permitted.
(iii) Assume missing data suitably.

PART – A

1. List the various factors to be considered in deciding the factor of safety. **5**

2. Discuss the scope of ergonomics in product design. **5**

3. Identify the meaning of different colours as per Morgan's code. **5**

PART – B

4. (a) Explain the necessity of riveted joint. **5**

(b) Two plates 16 mm thick are joined by a double riveted lap Joint. The pitch of each row of rivet is 90 mm. The rivets are 25 mm in diameter. The permissible stresses are as follows :

σ_t = 140 MPa; τ = 110 MPa; σ_c = 240 MPa.

Find the efficiency of the Joint. **15**

OR

(a) Differentiate between Bolt, Stud and Nut. **5**

(b) A steam engine cylinder has an effective diameter of 350 mm and the maximum steam pressure acting on the cylinder cover is 1.25 N/mm^2. Calculate the number and size of studs required to fix the cylinder cover, assuming the permissible stress in the studs as 33 MPa. **15**

5. (a) State the properties of materials used for shafts. 5

(b) Find the diameter at solid shaft to transmit 20 kW at 240 rpm. The ultimate shear stress for the steel may be taken as 360 MPa and factor of safety as 8. If a hollow shaft is to be used in place of solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5. 15

OR

(a) Explain the effect of keyway cut into the shaft. 5

(b) A shaft made of mild steel is required to transmit 100 kW at 300 rpm. The supported length of the shaft is 8m. It carries two pulleys each weighing 1500 N supported at a distance of 1 m from the ends respectively. Assuming the safe value of stress as 60 MPa and allowable tensile stress not to exceed 100 MPa. Determine the dia of the shaft. 15

6. (a) Explain the significance of Whal's factor. 5

(b) Design a helical spring for a maximum load of 1000 N for a deflection of 25 mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84 kN/mm^2 with considering Whal's factor. 15

OR

(a) Explain the construction of leaf spring. 5

(b) Design a valve spring of a petrol engine for the following operating conditions :

Spring load when the valve is open = 400 N

Spring load when the valve is closed = 250 N

maximum inside dia of spring = 25 mm

length of spring when the valve is open = 40 mm

length of spring when the valve is closed = 50 mm

maximum permissible shear stress = 400 MPa. 15

PART – C

7. Design a cast iron flange coupling for a MS shaft transmitting 90 kW at 250 rpm. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1° in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 MPa. 25

1774 **Code : 15ME52T**

Register Number | | | | | | | |

V Semester Diploma Examination, Nov./Dec. 2017

APPLIED THERMAL ENGINEERING

Time : 3 Hours | **| Max. Marks : 100**

Note : (i) Answer any **six** questions from Part A and any **seven** from Part – B.
(ii) Use of steam tables and Mollier chart is permitted.
(iii) Assume suitable missing data.

PART – A

(Each question carries 5 marks)

1. Define : **5**
   (a) Wet steam (b) Superheated steam
   (c) Saturation temperature (d) Dryness fraction of steam
   (e) Dry saturated steam

2. Explain with a neat sketch a Barrel type steam Calorimeter. **5**

3. List both the boiler mountings and accessories. **5**

4. Differentiate between water tube and firetube boiler. **5**

5. Sketch and explain Barometric jet condenser. **5**

6. List the functions of cooling tower and classify the cooling towers. **5**

7. Compare Impulse and Reaction turbines. **5**

8. Explain in brief the working principle of single stage reciprocating air compressor with a neat figure. **5**

9. Define : **5**
   (a) Refrigeration (b) C.O.P.
   (c) Dry air (d) Absolute humidity
   (e) Dew point temperature

PART – B

(Each question carries 10 marks)

10. The steam enters an engine at a pressure of 12 bar with a 65 °C of superheat. It is exhausted at a pressure of 0.15 bar and 0.95 dry. Find the drop in enthalpy of the steam. Use steam tables only. **10**

11. Sketch and label a Babcock & Wilcox boiler. **10**

12. With a neat sketch explain Carnot cycle and also derive its efficiency. **10**

13. (a) Compare natural draught and artificial draught system. **5**
    (b) Explain velocity compounding of impulse turbine. **5**

14. Superheated steam enters a convergent – divergent nozzle at 20 bar and 400 °C with a negligible velocity and mass flow rate of 2.5 kg/s and it exits at a pressure of 3 bar. The flow is isentropic between the nozzle entrance and throat and overall efficiency is 90%. Determine (a) Throat and (b) Exit areas.
    Use Mollier chart only. **10**

15. (a) Explain Friction in a Nozzle. **5**
    (b) Explain super saturated flow through Nozzle. **5**

16. Steam issues from the nozzle of a simple impulse turbine with a velocity of 900 m/s. The nozzle angle is 20°, the mean diameter of the blade rotor is 25 cm and the speed of rotation is 20,000 rpm. The mass of flow of steam through the turbine nozzle and blading is 0.18 kg/s. Draw the velocity diagram and calculate : **10**
    (i) Power developed
    (ii) Blade efficiency
    (iii) Tangential force on blades
    (iv) Axial force on blades
    (v) Inlet angle of blades
    Use graphical method only.

17. Explain with a neat line diagram the construction and working of De-Laval turbine. **10**

18. A single cylinder single acting reciprocating air-compressor has a cylinder of 24 cm dia. and linear piston speed of 100 m/min. It takes air at 100×10^3 N/m^2 and delivers at 1×10^6 N/m^2. Determine the indicated power of the compressor. Assume the law of compression to be $PV^{1.25} = C$. The inlet temperature of air at inlet is 288 K. Neglect the clearance effect **10**

19. (a) Explain with a neat sketch vapour compression refrigeration system. **5**
    (b) Explain with a neat sketch winter air-conditioning system. **5**

1775

Code : 15ME53T

Register Number | | | | | | | |

V Semester Diploma Examination, Nov./Dec. 2017

MACHINE DESIGN

Time : 3 Hours] **[Max. Marks : 100**

Note : (i) Answer all questions.

(ii) Any missing data may be suitable assumed.

(iii) Use of design data hand book is permitted.

PART – A

1. Sketch and lable the salient features of stress-strain diagram for mild steel. 5

2. List with examples five basic forms for the shape of product. 5

3. Explain the ergonomics consideration in design of controls. 5

PART – B

4. (a) Discuss the stresses induced in internal stresses due to screwing up forces, due to static loading for screwed fasteners. 5

(b) A steam engine cylinder has an effective diameter of 350 mm and the maximum steam pressure acting on the cylinder cover is 1.25 N/mm^2. Calculate the number and size of studs required to fix the cylinder cover, assuming the permissible stress in the studs as 33 MPa. 15

OR

(a) Define efficiency of rivetted joint. 5

(b) Find the efficiency of the double rivetted lap joint with zig-zag riveting is to be designed for 13 mm thick plates. Assume 80 MPa, 60 MPa and 120 MPa in tension, shear and crushing respectively. State how joint will fail and calculate pitch of rivets. 15

5. (a) List different types of keys. **5**

(b) Design the rectangular key for shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa and write key dimensions. **15**

OR

(a) Explain how the shafts are designed when it is subjected to twisting moment only on strength basis. **5**

(b) Select the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for the steel may be taken as 360 MPa and factor of safety as 8. If a hallow shaft is to be used in place of solid shaft, find the inside and outside diameter when the ratio of inside to outside is 0.5. **15**

6. (a) Explain the applications of spring. **5**

(b) Design a helical compression spring for a maximum load of 1200 N for a deflection of 25 mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84 kN/mm^2, with considering Wahl's factor. **15**

OR

(a) Define the terms used in compression spring : **5**

(i) Solid length (ii) Free length

(iii) Spring index (iv) Spring rate

(v) pitch

(b) Design a valve spring of a petrol engine for the following operation conditions :

Spring load when the valve is open = 400 N

Spring load when the valve is closed = 250 N

Maximum inside diameter of spring = 25 mm

Length of the spring when the valve is open = 40 mm

Length of spring when the valve is closed = 50 mm

Maximum permissible shear stress = 400 MPa **15**

PART – C

7. Design a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shear stress for cast iron is 14 MPa. **25**

1776

Code : 15ME54T

Register Number | | | | | | | |

V Semester Diploma Examination, Nov./Dec. 2017

MECHATRONICS

Time : 3 Hours | **| Max. Marks : 100**

Note : Answer any **six** questions from Part – **A** and any **seven** from Part – **B**.

PART – A **6 × 5 = 30**

1. Define sensors and transducers with an example. **5**

2. Explain control systems and their types. **5**

3. What are Digital signals ? **5**

4. Explain briefly Data acquisition system. **5**

5. List all types of Ball bearings. **5**

6. Explain the terms commonly used for specifying stepper motors. **5**

7. List different control modes. **5**

8. Explain briefly Adaptive Control and its three stages of operations. **5**

9. Explain Ladder programming and its sequences with line diagram. **5**

PART – B **7 × 10 = 70**

10. Make use of a sketch to explain the Hall Effect Sensors. **10**

11. Make use of a sketch to explain piezoelectric sensors. **10**

12. Construct the truth table and symbolical representation for the following logic gates : **10**
    (a) NAND gate
    (b) NOR gate
    (c) XOR gate
    (d) OR gate

13. Make use of a sketch to explain LCD. **10**

14. Make use of a sketch to explain MOSFETs. **10**

15. Make use of a sketch to explain the basic working principle of DC motor. **10**

16. Make use of a line diagram to explain model of building up a spring-dashpot-mass mechanical system. **10**

17. Make use of a sketch to explain the rotational – translational system. **10**

18. Construct the ladder diagram for the following functions : **10**
    (a) Delay-on timer
    (b) Delay-off timer

19. Make use of a neat sketch to explain Engine Management System. **10**

1342

Code : 15ME54T

Register Number

V Semester Diploma Examination, April/May-2018

MECHATRONICS

Time : 3 Hours] **[Max. Marks : 100**

Note : Answer any **six** questions from Part – **A** and **seven** questions from Part – **B**.

PART – A

6 × 5 = 30

1. Define Mechatronics with example. **5**

2. Define the terms : **5**
   (i) Range
   (ii) Error
   (iii) Sensitivity
   (iv) Repeatability
   (v) Dead band.

3. List the selection of DAQ criteria. **5**

4. List different data presentation elements. **5**

5. Explain briefly Ratchef and Pawl Mechanism. **5**

6. Explain the terms commonly used in specifying stepper motor. **5**

7. Explain thermal system building blocks. **5**

8. Explain briefly adaptive control and its three stages of operations. **5**

9. Explain microcontroller with block diagram. **5**

[Turn over

PART – B

$7 \times 10 = 70$

10. Explain the elements of closed loop control system with neat sketch. 10

11. (a) Explain variable reluctance tacho generator with neat sketch. 5

    (b) Explain with neat sketch strain gauge load cell. 5

12. Explain NOR and NAND logic gates with symbolic representation, Boolean algebra and truth table. 10

13. Explain the function of laser printer with neat sketch. 10

14. (a) Explain Relays with neat sketch. 5

    (b) Explain the functions of diodes with characteristic curve. 5

15. Explain the working principle of D.C. motor with neat sketch. 10

16. Explain different mechanical system basic building blocks with line diagrams. 10

17. Explain with neat sketch :

    (a) Rotational-translational system. 5

    (b) Rotary potentiometer. 5

18. Construct a PLC ladder diagram for master and jump controls and briefly explain them. 10

19. Explain different types of network topologies with line diagrams. 10

1339 **Code : 15ME51T**

Register Number | | | | | | | |

V Semester Diploma Examination, April/May-2018

INDUSTRIAL MANAGEMENT

Time : 3 Hours] **[Max. Marks : 100**

Note : (i) Answer any **six** from Part – **A**.
(ii) Answer any **seven** from Part – **B**.

PART – A

1. List any five advantages of partnership organisation. **5**

2. Mention any five factors to decide the project capacity. **5**

3. Explain process layout with block diagram. **5**

4. List the duties of Purchasing officer. **5**

5. Explain different types of tender. **5**

6. Write any five functions of Quality Control Department. **5**

7. Explain briefly about PDCA cycle. **5**

8. List the personal protective devices for prevention of accident. **5**

9. Mention the effects of acid rain. **5**

PART – B

10. Illustrate line organisation with chart and also write its advantages. 10

11. Illustrate floor inspection with advantages and disadvantages. 10

12. Write the specimen copy for preparation of comparative statement and Bin card. 10

13. Illustrate Enterprise Resource Planning (ERP) system with structure and applications. 10

14. Illustrate the procedure and documentation steps involved in ISO 9000 Certification with benefits. 10

15. Illustrate Histogram with graphical representation. 10

16. Illustrate fire triangle and also explain about classification of Fire. 10

17. Illustrate rain water harvesting system with a neat sketch. 10

18. (a) Explain municipal solid waste with causes and effects. 5

    (b) Explain breakdown maintenance with advantages and disadvantages. 5

19. (a) Explain any five Henry Fayol's principles of management. 5

    (b) Explain centralized store with its layout. 5

1340

Code : 15ME52T

Register Number | | | | | | | |

V Semester Diploma Examination, April/May-2018

APPLIED THERMAL ENGINEERING

Time : 3 Hours] **[Max. Marks : 100**

Note : (i) Answer any **six** questions from Part – **A** and **seven** from Part – **B.**
(ii) Use of steam tables, Mollier charts is permitted.
(iii) Assume any missing data suitably.

PART – A **6 × 5 = 30**

1. Define terms :
   (i) Wet steam
   (ii) Dry saturated steam
   (iii) Dryness fraction of steam and mention the formula to find dryness fraction of steam along with notations used.

2. Explain separating calorimeter with a neat sketch.

3. Classify steam boilers according to various factors.

4. Define steam condenser and list any two objectives or main functions of a condenser.

5. List the functions of a cooling tower.

6. Draw the velocity diagram of a impulse turbine blades.

7. Explain working of simple De-Laval turbine with line diagram.

8. Classify the air compressors based on various factors.

9. List the factors affecting choice of refrigerants.

PART – B $7 \times 10 = 70$

10. Steam enters an engine at a pressure of 12 bar with a 67 °C of superheat. It is exhausted at a pressure of 0.15 bar and 0.95 dry. Find drop in enthalpy of the steam.

11. Find the internal energy of 1 kg of superheated steam at a pressure of 10 bar and 280 °C. If this steam be expanded to a pressure of 1.6 bar and 0.8 dry, determine the change in internal energy. Assume specific heat of super heated steam as 2.1 kJ/kg K.

12. Describe with the help of neat sketch the construction and working of a Cochran boiler.

13. (a) Distinguish between water tube and fire tube boilers. 5
    (b) Differentiate between forced draught and induced draught. 5

14. Describe with a neat sketch the operation of an evaporative condenser.

15. Dry saturated steam at a pressure of 8 bar expands through a convergent-divergent nozzle, if the discharge pressure is 1.5 bar, find the ratio of the cross sectional area at exit to that at throat for a frictionless adiabatic flow when the discharge is maximum.

16. A steam jet enters the row of blades with a velocity of 375 m/s at an angle of 20° with the direction of motion of the moving blades. If the blade speed is 165 m/s. find suitable inlet and outlet blade angles assuming that there is no thrust on the blades. The velocity of the steam passing over the blades is reduced by 15%. Also determine power developed by the turbine per kg of steam flowing over the blades per second.

17. The outlet area of the nozzles in a simple impulse turbine is 15.5 cm^2 and the steam leaves them 0.91 dry at 1.4 bar and at 920 m/sec. The blade angles are 30° at inlet and exit, and the blade velocity is 0.25 of the steam velocity at the exit from the nozzle. The friction factor 0.8. Find (a) Nozzle angle (b) The power developed (c) the diagram efficiency (d) The axial thrust on the blading.

18. A single acting reciprocating air compressor has a cylinder diameter and stroke of 200 mm and 300 mm respectively. The compressor sucks air at 1 bar and 27 °C and delivers at 8 bar while running at 100 r.p.m. Find (1) Indicated power of the compressor (2) Mass of air delivered by the compressor per minute.

19. Explain vapour compression refrigeration with flow diagram and write two advantages and disadvantages.

1773

Code : 15ME51T

Register Number | | | | | | | |

V Semester Diploma Examination, Nov./Dec. 2017

INDUSTRIAL MANAGEMENT

Time : 3 Hours] **[Max. Marks : 100**

Note : Answer any **six** questions from Part – **A** and any **seven** from Part – **B.**

PART – A

1. List Henry Fayol's principles of management. **5**

2. Explain the process of communication. **5**

3. Define productivity and list the factors to improve productivity. **5**

4. Explain routing. **5**

5. Define materials management and list the functions of materials management. **5**

6. List the objectives of plant maintenance. Name the types of plant maintenance. **5**

7. Explain preventive maintenance and its advantages. **5**

8. List the effects and control measures of acid rain. **5**

9. Explain ozone layer depletion. **5**

PART – B

10.		Explain line organisation, with advantages and disadvantages.	10
11.		Explain the functions of PPC and functions of dispatching.	10
12.	(a)	Explain centralised stores and its advantages.	5
	(b)	Explain the concept, JIT (Just in time)	5
13.		Explain purchasing, its objectives and methods of purchasing.	10
14.		Explain Enterprise Resource Planning (ERP) and its applications.	10
15.	(a)	Define quality control and list the objectives of quality control.	5
	(b)	Explain 5 S house keeping.	5
16.		Explain Pareto charts with graphical representation.	10
17.		Explain ISO 9000 series and benefits of ISO 9000.	10
18.		Explain total productive maintenance, its objectives and benefits.	10
19.	(a)	Explain briefly causes and effects of environmental pollution.	5
	(b)	Explain rain water harvesting.	5