

G 5125

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Reg. No.....

Name.....

**B.TECH. DEGREE EXAMINATION, MAY 2017**

**Eighth Semester**

Branch : Mechanical Engineering/Aeronautical Engineering

ME 010 804 L03/AN 010 805 G03—CRYOGENICS [Elective III (ME)] (Elective IV) [AN]

Time : Three Hours

Maximum : 100 Marks

*Use Refrigeration charts and tables HMT data book & Steam tables are permitted.*

**Part A**

*Answer all questions.*

*Each question carries 3 marks.*

1. Explain the term cryogenics.
2. Explain Meissner effect.
3. Briefly explain the term Figure of Merit (FDM) used in liquifaction system.
4. Draw a reversible isochoric source refrigeration cycle.
5. What is the need of vapour diffuser in dewar vessel design ?

(5 × 3 = 15 marks)

**Part B**

*Answer all questions.*

*Each question carries 5 marks.*

6. Explain various applications of cryogenics in drug discovery.
7. Explain the properties that changes when a material transit from normal state to super conducting state.
8. Explain precooled Linde Hampson liquifaction system.
9. Explain a method to obtain a temperature lower than that achievable for a liquid nitrogen.
10. Explain the different safety devices used in dewar vessel with neat sketches.

(5 × 5 = 25 marks)

**Part C**

*Answer all questions.*

*Each full question carries 12 marks.*

11. (a) What are the application of cryogenics in the field of superconducting and biomedical sector. (8 marks)  
(b) Write short note on cryogenic upper stage (CUS). (4 marks)

Or

**Turn over**

12. (a) What are the application of cryogenics in food storage and cryosurgery ? (8 marks)  
(b) Write a short note on frost bite. (4 marks)
13. (a) Write short note on electrical and magnetic properties of material at cryogenic temperature. (6 marks)  
(b) Explain various isotopes of Helium. Explain various effects of these isotopes. (6 marks)

Or

14. (a) Explain the difference between adiabatic expansion and isentropic expansion process with neat sketches. (6 marks)  
(b) Prove that Joule Thomson coefficient  $\mu_{JT}$  for ideal gas is zero. (6 marks)
15. (a) Determine liquid yield, the work unit mass compressed and work per unit mass liquified for simple Linde-Hampson system. The nitrogen portion of the system operates between 101.3 kPa and 300 K at point 1 and 20.3 MPa and 300 K at point Q. (8 marks)  
(b) Briefly explain the precooled Linde Hampson system for neon and hydrogen. (4 marks)

Or

16. (a) Explain collins Helium-Liquifaction system with neat sketch. (6 marks)  
(b) Explain the Linde-dual pressure system with neat sketch. Also draw the T-s diagram for the cycle. (6 marks)
17. (a) Briefly explain the working of magnetic refrigeration system with neat sketches. (6 marks)  
(b) Explain the working of Vuilleumier refrigerator with neat sketch. Explain the T-s diagram. (6 marks)

Or

18. (a) Explain the role of regenerator in Philips refrigerator. Draw the schematic of regenerator. (6 marks)  
(b) Explain the working of Solvay refrigerator with neat sketches. (6 marks)
19. (a) Write down the advantages and disadvantages of various insulations used in cryogenic systems. (7 marks)  
(b) Write a short note on vacuum jacketed, cryogenic, fluid transfer lines. (5 marks)

Or

20. Draw the Dewar vessel used for the cryogenic fluid storage, name the various parts and explain the need of various devices used in Dewar vessel.

[5 × 12 = 60 marks]

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Name.....

**B.TECH. DEGREE EXAMINATION, MAY 2017**

**Eighth Semester**

Branch : Mechanical Engineering/Production Engineering

PE 010 805 G01/ME 010 805 G01—INDUSTRIAL SAFETY

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours

Maximum : 100 Marks

**Part A**

*Answer all questions.*

*Each question carries 3 marks.*

1. What you understand by "safety" ?
2. Write notes on personal protective equipments.
3. Discuss role of workmen on safety involvement.
4. Why "house keeping" is necessary in an industry ?
5. What is "fire load" ?

(5 × 3 = 15 marks)

**Part B**

*Answer all questions.*

*Each question carries 5 marks.*

6. How safety and productivity relates each other ? Give comments on safety policy.
7. Write down accident prevention methods that can be adopted in an industry.
8. Discuss of "safety audit" and "safety survey".
9. Write down factors impending on safety. Discuss on each.
10. What is mean by fire risk ?

(5 × 5 = 25 marks)

**Part C**

*Answer all questions.*

*Each full question carries 12 marks.*

11. Explain :

- |                                   |                                |
|-----------------------------------|--------------------------------|
| (a) Safety planning.              | (b) Safety planning procedure. |
| (c) Formulation of safety policy. | (d) Safety budget.             |

(4 × 3 = 12 marks)

Or

**Turn over**

12. Explain the need, functions and types of safety organizations.

13. Explain :

- (a) Nature and causes of accidents.
- (b) Need of accident prevention.
- (c) Domino theory.

(3 × 4 = 12 marks)

*Or*

14. Explain :

- (a) Safety education and safety training.
- (b) Safety training methods.
- (c) Motivation and communication prevents accidents.

(3 × 4 = 12 marks)

15. Explain :

- (a) Job safety analysis. (5 marks)
- (b) Damage control and risk management. (7 marks)

*Or*

16. Explain role of management in safety.

17. Explain types of "industrial hazards".

*Or*

18. Explain the various activities on occupational health and hygiene.

19. Classify the "fire" and fire prevention activities.

*Or*

20. Explain fire protection systems.

[5 × 12 = 60 marks]

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Name.....

**B.TECH. DEGREE EXAMINATION, MAY 2017**

**Eighth Semester**

Branch : Mechanical Engineering

ME 010 803—PRODUCTION ENGINEERING (ME)

(Regular—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours

Maximum : 100 Marks

**Part A**

*Answer all questions.*

*Each question carries 3 marks.*

1. What is the meaning of cutting strain ?
2. List the properties of tool material.
3. What is the use of powder metallurgy ?
4. What is the influence of fiber length in composite materials ?
5. Write notes on LIGA process ?

(5 × 3 = 15 marks)

**Part B**

*Answer all questions.*

*Each question carries 5 marks.*

6. Briefly explain characteristics of BUE.
7. Write notes on Flank and crater wear of a tool.
8. Write short notes on compaction techniques.
9. Compare AX and  $A_m X_p$  crystal structures.
10. Write note on application of abrasive water jet machining process.

(5 × 5 = 25 marks)

**Part C**

*Answer all questions.*

*Each full question carries 12 marks.*

11. Explain :

(a) The mechanics of chip formation.

(6 marks)

(b) With neat figure single point cutting tool.

(6 marks)

Or

Turn over

12. Explain :

- (a) Classification of different types of chips. (6 marks)
- (b) Variable affecting tool life. (6 marks)

13. (a) Explain different types of tool materials and its properties. (6 marks)

- (b) Write notes on tool wear mechanisms. (6 marks)

*Or*

14. Explain :

- (a) Machinability of Ti, Al and Cv alloys. (6 marks)
- (b) Different types of cutting fluids. (6 marks)

15. Explain :

- (a) Sintering. (6 marks)
- (b) Advantages and disadvantages of P/M and its applications. (6 marks)

*Or*

16. Explain micromachining process.

17. Explain :

- (a) Phase diagram of  $Al_2O_3 - Cr_2O_3$  and  $MgO - Al_2O_3$ . (6 marks)
- (b) Ceramic application is heat engine ceramic armours and electronic packaging. (6 marks)

*Or*

18. Explain :

- (a) Influence of fiber length, orientation and concentration on fiber reinforced composites. (6 marks)
- (b) Matrix phase. (6 marks)

19. Explain :

- (a) Abrasive water jet machining. (6 marks)
- (b) EDM. (6 marks)

*Or*

20. Explain :

- (a) Stereo lithography. (6 marks)
- (b) Laser welding process. (6 marks)

[5 × 12 = 60 marks]

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Name.....

**B.TECH. DEGREE EXAMINATION, MAY 2017**

**Eighth Semester**

Branch : Mechanical Engineering

ME 010 804 L01 – AEROSPACE ENGINEERING (Elective III) [ME]

(New Scheme – 2010 Admissions)

Time : Three Hours

Maximum : 100 Marks

**Part A**

*Answer all questions.*

*Each question carries 3 marks.*

1. Explain the working of a static pitot tube.
2. Define compressible flow in terms of Mach Number of Aircraft.
3. What are the propeller coefficient used for the design of an aircraft?
4. Write a short note on Gliding of aircraft.
5. What are the liquid propellents used in liquid propelled rockets?

(5 × 3 = 15 marks)

**Part B**

*Answer all questions.*

*Each question carries 5 marks.*

6. Derive an expression for Stall speed of aircraft.
7. Write a short note on body upwash and body down wash in aerodynamics.
8. Write a short note on Range and Endurance of Aircraft.
9. Explain the working of a Scram Jet Engine with neat sketches.
10. Write a short note on Thrust time characteristics of solid propellant rockets.

(5 × 5 = 25 marks)

**Part C**

*Answer all questions.*

*Each full question carries 12 marks.*

11. What are the different layers in a standard atmosphere, and derive expression for variation of pressure and density with altitude in these layers?

Or

Turn over

12. An aircraft moving at an altitude of 4 km. The pressure sensed by the pitot tube on its right wing as  $6.7 \times 10^4 \text{ N/m}^2$ . At what Mach Number space craft is flying? At what Mach Number space craft should fly in sea level to experience the same dynamic pressure.
13. (a) What are the needs of dimensional analysis for the design of an aircraft?  
 (b) Using bucking harms  $\pi$  theorem, derive an expression for the Lift acting on an aerofoil.  
 (4 + 8 = 12 marks)
- Or*
14. (a) Briefly explain aerofoil lift characteristics with angle of attack.  
 (b) The pressure at a point on the wing of an airplane is  $7.58 \times 10^4 \text{ N/m}^2$ . The airplane is flying with a velocity of 70 m/s. at an altitude of 2000 m. Calculate the pressure and density of flow at that altitude, also calculate the pressure coefficient at this point of wing.  
 (4 + 8 = 12 marks)
15. (a) Derive an expression for propulsion efficiency.  
 (b) Explain the need for Bypass and After Burners in aircraft engines.  
 (6 + 6 = 12 marks)
- Or*
16. (a) Draw the characteristics of propulsion efficiency and propulsion coefficients with flight speed of an aircraft.  
 (b) Explain the working of turbofan engine with neat sketch.  
 (6 + 6 = 12 marks)
17. A plane has 4500 N acting on its wing under a wind loading of  $6000 \text{ N/m}^2$ . Drag equation is  $C_D = 0.03 + 0.04 C_L^2$ . After completing launch at 1000 m in still air, what will be the greatest distance the plane can cover and what will be the duration of flight possible. Also find the corresponding speeds of flight. Ignore changes of density of atmosphere.  
 (8 + 4 = 12 marks)
- Or*
18. (a) Derive an expression for maximum rate of climbing of an aircraft.  
 (b) Write a short note on 'minimum power conditions' of an aircraft and also write down the expression for this minimum power condition.  
 (8 + 4 = 12 marks)
19. (a) The altimeter of an aircraft reads 1524 m outside air temperature is 280.56 K. If the pitot tube reads 0.87 bar. Calculate the true velocity of aircraft. What is the equivalent air speed?  
 (b) Write short note on Gyro compass.  
 (8 + 4 = 12 marks)
- Or*
20. (a) Explain the Geysering effect in a liquid propellant system.  
 (b) Explain the working of pressure feed system in a liquid propellant rockets with neat sketch.  
 (4 + 8 = 12 marks)  
 [5 × 12 = 60 marks]



**B.TECH. DEGREE EXAMINATION, MAY 2017****Eighth Semester**

Branch : Mechanical Engineering/Automobile Engineering

AU 010 801/ME 010 801—DESIGN OF TRANSMISSION ELEMENTS (AU, ME)

(New Scheme—2011 Admission onwards)

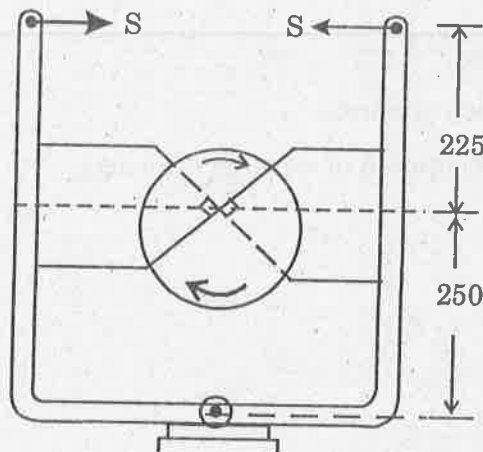
[Regular/Supplementary]

Time : Three Hours

Maximum : 100 Marks

*Answer any two questions each from Part A and Part B.**Each question carries 25 marks.**Assume missing data suitably.**Machine design data book as per syllabus is permitted.***Part A (Module 1 and 2)**

1. A centrifugal clutch is to be designed to transmit 15 kW at 900 r.p.m. The shoes are four in number. The speed at which the engagement begins is  $3/4^{\text{th}}$  of the running speed. The inside radius of the pulley rim is 150 mm. The shoes are lined with ferrado for which the coefficient of friction may be taken as 0.25. Determine :
  - (i) mass of the shoe ; (ii) size of the shoe.
2. The layout and dimension of a double shoe brake is shown in the figure. The diameter of the brake drum is 300 mm and the contact angle for each shoe is  $90^\circ$ . If the coefficient of friction for the brake lining and the drum is 0.4 :
  - (i) Find the spring force necessary to transmit a torque of 30 Nm.
  - (ii) Determine the width of the brake shoes, if the bearing pressure on the material is not to exceed  $0.28 \text{ N/mm}^2$ .

All dimension are  
in mm.

Turn over

3. A 80 mm long journal bearing supports a load of 3200 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and the viscosity of the oil is 0.025 kg/ms at the operating temperature. If the bearing is capable of dissipating 80 J/s, determine the maximum safe speed.
4. A ball bearing is to be selected to carry a load of 700 N, when running continuously at 500 r.p.m. for three years with only 10% failures. What catalog rating should be specified if bearing are rated on the basis of :
  - (a) 90% life expectancy of  $10^6$  revolutions.
  - (b) Average life of 10,000 hour at 1,000 r.p.m.
  - (c) Average life of 3,000 hour at 1,500 r.p.m.

(2 × 25 = 50 marks)

#### Part B (Module 3 and 4)

5. A pair of helical gears are to transmit 15 kW. The teeth are  $20^\circ$  stub in diametral plane and have a helix angle of  $45^\circ$ . The pinion runs at 10,000 r.p.m. and has 80 mm pitch diameter. The gear has 320 mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100 MPa. Determine a suitable module and face width from static strength considerations and check the gears for wear. Assume  $\sigma_{es} = 618$  MPa.
6. Design a right angle bevel gear drive with speed of pinion shaft = 300 r.p.m. and that of gear shaft = 150 r.p.m. Pinion is to have 20 teeth of involute profile with module of 20 mm and a pressure angle of  $20^\circ$  and is to be of suitable material. Gear is of forged steel having allowable stress of  $150 \text{ N/mm}^2$ . The power to be transmitted is 56 kW. Assume service factor as 2.
7. A single cylinder IC engine working on a four stroke cycle develops 75 kW at 360 r.p.m. The fluctuation of energy can be assumed to be 0.9 times the energy developed per cycle. If the fluctuation of speed is not to exceed 1 per cent and the maximum centrifugal stress in the flywheel is to be 5.5 MPa. Estimate the mean diameter and the cross-sectional area of the rim. The material of the rim has a density of  $7200 \text{ kg/m}^3$ .
8. (a) Explain the design recommendation for :
  - (i) Welded products.      (ii) Casting products.(b) With suitable example, explain the preparation of working drawings.

(2 × 25 = 50 marks)

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Name.....

**B.TECH. DEGREE EXAMINATION, MAY 2017**

**Eighth Semester**

Branch : Mechanical Engineering/Automobile Engineering

ME 010 802/AU 010 802—OPERATIONS MANAGEMENT (AU, ME)

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours

Maximum : 100 Marks

**Part A**

Answer all questions.

Each question carries 3 marks.

1. Explain system approach of operations management.
2. Write a note on CRP.
3. Distinguish between Flow shop scheduling and Job shop scheduling.
4. What is the need of replacement ?
5. Write short notes on Kanban system.

(5 × 3 = 15 marks)

**Part B**

Answer all questions.

Each question carries 5 marks.

6. Discuss strategic, tactical and operational decision in management process.
7. Define aggregate planning. What are its objectives ?
8. Explain 'n' jobs '3' machines problems using Johnson's algorithm.
9. Explain bath-tub-curve of failure.
10. Discuss the various drivers of supply chain.

(5 × 5 = 25 marks)

**Part C**

Answer all questions.

Each full question carries 12 marks.

11. Enumerate in detail the various objectives of demand forecasting. Also explain any two qualitative and quantitative forecasting methods.

Or

Turn over

12. A firm uses simple exponential smoothing with  $\alpha = 0.2$  to forecast demand. The forecast for the first week of January was 400 units, where as the actual demand turned out to be 450 units :
- Forecast the demand for second week of January.
  - Assume that actual demand during the second week of January turned out to be 460 units. Forecast the demand upto February third week, assuming subsequent demands as 465, 434, 420, 498 and 462 units.

13. Explain with an example, transportation model for aggregate planning.

Or

14. How MRP differs from inventory control system ? Explain the various terms associated with MRP. Also explain the benefits of MRP.
15. We have four jobs, each of which has to go through the machines  $M_j, j = 1, 2, 3, \dots, 6$  in the order  $M_1, M_2, \dots, M_6$ . Processing time (in hours) is given below. Determine the sequence of these four jobs that minimize the total time elapsed :

Jobs (j)	Machines					
	$M_1$	$M_2$	$M_3$	$M_4$	$M_5$	$M_6$
$J_1$	18	8	7	2	10	25
$J_2$	17	6	9	6	8	19
$J_3$	11	5	8	5	7	15
$J_4$	20	4	3	4	8	12

Or

16. A machine shop has four machines A, B, C and D. Two jobs must be processed through each of these machines. The time taken (hrs.) on each of the machine and the necessary sequence of jobs are given below. Use graphical method to obtain the total time elapsed :

Job 1	Sequence of machine	A	B	C	D
	Time (hrs.)	2	4	5	1
Job 2	Sequence of machine	D	B	A	C
	Time (hrs.)	6	4	2	3

17. (a) Define Reliability. What are the various measures of maintenance performance. (6 marks)
- (b) Explain with example reliability of a parallel and series system. (6 marks)

Or

18. What are the objectives of maintenance management ? Explain different preventive maintenance techniques.
19. (a) Explain JIT manufacturing. Discuss the broad implication for its implementers. (6 marks)
- (b) Discuss the different types of waste in lean manufacturing. What are the tools to reduce waste ? (6 marks)

Or

20. Explain the objectives of supply chain management. Discuss its process view.

[5 × 12 = 60 marks]