

B.TECH. DEGREE EXAMINATION, MAY 2016**Eighth Semester**

Branch : Automobile Engineering / Mechanical Engineering

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

(New Scheme—2011 Admission onwards)

[Regular/Supplementary]

Time : Three Hours

Maximum : 100 Marks

*Answer any two questions from Part A and Part B.**Each question carries 25 marks.**Use of standard Design Data book is permitted.**Assume missing data suitably if any.***Part A (Module 1 and 2)**

1. A cone clutch with cone angle 20° is to transmit 7.5 kW at 750 r.p.m. The normal intensity of pressure between the contact faces is not to exceed 0.12 N/mm^2 . The coefficient of friction is 0.2. The face width is $1/5^{\text{th}}$ of mean diameter of friction lining. Assuming uniform wear find (i) The main dimensions of the clutch, and (ii) Axial force required while running.
2. A differential band brake is to be designed for a winch lifting a load of 45 kN through a rope wound round a barrel of 500 mm. diameter. The brake drum is to be 600 mm. diameter and the angle of the lap of the brake band over the drum is 250° respectively. Determine the width and thickness of the band. Operating arms of the brake are 40 mm and 200 mm. Operating lever is 1.5 m. long.
3. A full journal bearing operating under a steady load has the following specifications :
 - Journal Diameter = 60 mm.
 - Bearing Length = 60 mm.
 - Type of oil = SAE 30
 - Load on bearing = 3.46 kN
 - Journal speed = 1020 r.p.m.
 - Radial clearance = 45 microns.
 - Inlet temperature of oil = 40°C .

Calculate (i) Power lost in friction ; (ii) Max oil pressure ; and (iii) Temperature rise.

Turn over

4. Design a Journal bearing for a centrifugal pump to the following specification :

Diameter of journal = 75 mm.

Speed = 1440 r.p.m.

Load = 12 kN.

Working temperature = 60°C

Ambient temperature = 25°C.

Part B (Module 3 and 4)

5. Design a straight spur gear drive to transmit 8 kW The pinion speed is 720 r.p.m. and the speed ratio is 2. Both the gears are made of the same surface hardened carbon steel with 55 RC and core hardness less than 350 BHN. Ultimate strength is 720 N/mm² and yield strength of 360 N/mm².
6. A pair of helical gears subjected to moderate shock loading is to transmit 37.5 kW at 1750 r.p.m. of the pinion. The speed reduction ratio is 4.25 and the helix angle is 15°. The service is continuous and the teeth are 20° full depth in the normal plane. Design the gears, assuming a life of 10,000 hours.
7. Design a cast iron flywheel to store 7 kNm of energy to keep the speed between 306 and 294 r.p.m. outer diameter of flywheel is not to be more than 1.5 m. Design the rim and arms of flywheel. Power developed by the machine is 20 kW. Maximum torque = 1.5 times the mean torque.
8. Describe the design recommendations with appropriate sketches for (i) Castings ; and (ii) Forgings.

(4 × 25 = 100 marks)

B.TECH. DEGREE EXAMINATION, MAY 2016**Eighth Semester**

Branch : Mechanical Engineering/Automobile Engineering

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

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours

Maximum : 100 Marks

*Use of standard statistical table is permitted.
Assume missing data suitably if any.*

Part A*Answer all questions.**Each question carries 3 marks.*

1. What is the strategic perspective of operation and production management ?
2. State the purpose of master scheduling and how it is important for operation planning ?
3. How the job-shops are different from flow-shops ?
4. What is FMECA ?
5. Name any *two* ERP packages.

(5 × 3 = 15 marks)

Part B*Answer all questions.**Each question carries 5 marks.*

6. Explain any *two* important measures of forecast accuracy.
7. How the demand is met using level production strategy in Aggregate Planning ?
8. Explain the computational complexities involved in solving Job-shop scheduling problem.
9. State the important differences between Individual replacement policy and Group replacement policy.
10. Discuss the differences between push and pull system.

(5 × 5 = 25 marks)

Turn over

Part C

*Answer all questions.
Each full question carries 12 marks.*

11. Use the sales data given below to determine : (a) The least squares trend line ; and (b) The predicted value for 2015 sales.

| <i>Year</i> | | <i>Sales (Units)</i> |
|-------------|-----|----------------------|
| 2008 | ... | 100 |
| 2009 | ... | 110 |
| 2010 | ... | 122 |
| 2011 | ... | 130 |
| 2012 | ... | 139 |
| 2013 | ... | 152 |
| 2014 | ... | 164 |

Or

12. Exponential smoothing is used to forecast automobile battery sales. Two value of α are examined, $\alpha = 0.8$ and $\alpha = 0.5$. Evaluate the accuracy of each smoothing constant. Which is preferable ? (Assume the forecast for January was 22 batteries) Actual sales are given below :

| <i>Month</i> | | <i>Actual Battery Sales</i> |
|--------------|-----|-----------------------------|
| January | ... | 20 |
| February | ... | 21 |
| March | ... | 15 |
| April | ... | 14 |
| May | ... | 13 |
| June | ... | 16 |

13. Explain with an illustration how transportation model is used to solve the Aggregate planning problem ?

Or

14. What is Lot sizing ? How lot sizing is carried out in MRP and MRP II ?

15. A company is faced with seven tasks that have to be processed through two work centers. Assume work center I works continuously. Data appear below in hours :

| Task | | Work Centre I | Work Centre II |
|------|-----|---------------|----------------|
| A | ... | 2.58 | 3.47 |
| B | ... | 1.66 | 5.84 |
| C | ... | 2.71 | 2.41 |
| D | ... | 5.52 | 1.99 |
| E | ... | 3.38 | 7.62 |
| F | ... | 5.22 | 1.73 |
| G | ... | 2.89 | 1.11 |

Find the job sequence using Johnsons rule and also calculate time in hours to complete all the tasks in both work centers.

Or

16. Processing time (including setup times) and due date for six jobs waiting to be processed at a work center are given in the following table. Determine the sequence of jobs, and the average flow time (ACT) at the work center for FCFS (First Come First Served and EDD (Earliest Due Date) rules (assume jobs arrived in the order shown).

| Job | ... | A | B | C | D | E | F |
|-----------------|-----|---|----|---|----|----|----|
| Processing Time | ... | 2 | 8 | 4 | 10 | 5 | 12 |
| Due Date | ... | 7 | 16 | 4 | 17 | 15 | 18 |

17. Explain the concept of product failure behavior using bath tub curve with suitable illustration and example.

Or

18. Briefly describe the eight pillars of Total Productive Maintenance (TPM) system.
 19. Discuss the importance of JIT and indicate its application.

Or

20. Write notes on the basis of : (a) Lean Manufacturing ; (b) Flexible Manufacturing System (FMS) ; (c) Kanban System.

(5 × 12 = 60 marks)

G 1705

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B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Mechanical Engineering

ME 010 802—PRODUCTION ENGINEERING (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. Define performance parameters.
2. What is tool life ?
3. Distinguish solid and liquid phase sintering.
4. Define co-ordination number.
5. What is the use of laser welding ?

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Explain how frictions affect machining process ?
7. What are the applications of cutting fluids ?
8. Powder metallurgy is evil or essential. Explain.
9. Write a note on fiber reinforced composites.
10. What is LIGA process ?

(5 × 5 = 25 marks)

Turn over

Part C

*Answer all questions.
Each question carries 12 marks*

11. Explain the geometry of single cutting tool with a neat sketch.

Or

12. What are the differences between orthogonal and oblique cutting ? Explain with respective mechanisms.

13. Explain the classification, structure, composition and properties of HSS.

Or

14. What are the tool wear mechanisms ? Explain each of them.

15. How is fine powder characterized ? What are the parameters ?

Or

16. Write a note on micro-machining. Explain different processes involved in it.

17. What are particle reinforced composites ? Explain with their properties and applications.

Or

18. How do ceramic structures differ from other materials ? Explain with the significant properties.

19. Explain any *two* non-traditional machining processes.

Or

20. Explain rapid prototyping and stereolithography.

(5 × 12 = 60 marks)

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B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Mechanical Engineering

ME 010 804 L01—AEROSPACE ENGINEERING (Elective III) (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. Write the energy equation for two dimensional compressible flow.
2. Define centre of pressure and aerodynamic centre.
3. What is the use of conical spike in a ramjet engine ?
4. List the high lift devices used in an aircraft.
5. Distinguish subsonic and supersonic wind tunnels.

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Explain the Pressure, temperature, density variations of air by using International standard atmosphere chart.
7. Explain the pressure distribution over an aerofoil with neat sketch.
8. Compare the working efficiency of Turbojet, Turbo fan and Ramjet engines.
9. How is the aircraft performance affected by weight and altitude during the level flight ?
10. Give the procedure to measure the true air speed by using air speed indicators.

(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.

Each full question carries 12 marks.

11. (a) Derive the Navier stokes equations for a three dimensional, unsteady, compressible and viscous flow with body and pressure forces.
- (b) Apply the Bernoulli's principle to simplify the Navier stoke equations of two dimension body.

Or

12. (a) How do the static, dynamic and stagnation pressure vary in the supersonic flow condition ?
- (b) Determine the temperature, pressure, density and velocity of sound at altitudes of 3000, 9000, 16000 meters. Assume starting properties at mean sea level.
13. In low- speed, incompressible flow, the following experimental data are, obtained for an NACA 4412 airfoil section at an angle of attack of 4° : $C_1 = 0.85$ and $C_{m,c/4} = -0.09$. Calculate the location of centre of pressure.

Or

14. Consider an NACA 2412 airfoil with a chord of 0.64 m in an airstream at standard sea level conditions. The free stream velocity is 70 m/s. The lift per unit span is 1254 N/m. Calculate the angle of attack and the drag per unit span.
15. Explain with the help of neat sketch the working of Turbo fan engine. Write down its advantages and limitations.

Or

16. What is blade element theory ? How can you calculate the performance of airscrew by using this theory ?
17. (a) Explain how an aeroplane can fly at a wide range of air speeds.
- (b) Explain the service ceiling and absolute ceiling.

Or

18. Derive the conditions for minimum drag and minimum power condition for a steady level flight.
19. An air plane climbs at 20° to the horizontal at 120 km/hr. If it weighs 600 kg and the drag force is 110 kg, find (i) the HP required in overcoming the drag (ii) the HP required in overcoming the force of gravity and (iii) the HP required for the climb.

Or

20. (a) Explain the phenomenon of geysering in liquid propellant rockets. When does it occur ? Explain your answer with neat sketches.
- (b) Explain the phenomenon propellant hammer in liquid propellant rocket engine with a neat sketch.

(5 × 12 = 60 marks)

B.TECH. DEGREE EXAMINATION, MAY 2016**Eighth Semester**

Branch : Mechanical Engineering / Aeronautical Engineering

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

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Use of refrigeration charts and tables, heat and mass transfer data book and steam tables are permitted.

Part A

*Answer all questions.
Each question carries 3 marks.*

1. Discuss the application of cryogenics in food processing.
2. Explain super conductivity.
3. What are limitations of simple Linde-Hampson system ?
4. What is the influence of regenerator effectiveness in Philips refrigerator ?
5. Write notes on Cryo pumping.

(5 × 3 = 15 marks)

Part B

*Answer all questions.
Each question carries 5 marks.*

6. Explain the variation of Fatigue strength and impact strength of materials in cryogenic temperature range. Support with suitable graphs.
7. Describe different molecular forms of hydrogen.
8. What are the heat exchanger configurations of Liquefaction system ?
9. Explain the working of Vuillemier refrigerator.
10. Derive an expression for COP of Carnot Refrigerator.

(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.

Each full question carries 12 marks.

11. (a) Discuss the application of cryogenics in rocket propulsion application.
(b) Explain Cryosurgery and Cryopreservation.

Or

12. (a) Discuss the chronology of cryogenic technology.
(b) What are the application areas of cryogenic engineering ?
13. (a) Explain Joule-Thomson effect.
(b) Discuss thermal properties of engineering materials at low temperature.

Or

14. (a) Discuss the properties of Helium isotopes at cryogenic range.
(b) What are the electrical and magnetic properties of materials at cryogenic range ?
15. (a) Describe Claude system with neat sketch. Explain the TS diagram.
(b) Explain Collins Helium liquefaction system.

Or

16. (a) Explain ortho-para hydrogen conversion in liquefier with figure.
(b) Determine the liquid yield, the amount of nitrogen boiled away per unit mass of hydrogen liquefied and the work required per unit mass of hydrogen liquefied for a pre cooled Linde-Hampson system operating from 101.3 kPa (1 atm) and 300 K to 5.066 MPa (50 atm). The nitrogen bath is at temperature of 70 K corresponding to a saturation pressure 38.5 kPa.
17. What do you mean by magnetic cooling ? Explain adiabatic demagnetization process with the help of neat sketch.

Or

18. Describe Gifford-McMahon refrigerator with neat sketches and explain the TS diagram.
19. Explain cryogenic fluid storage vessels with neat sketches.

Or

20. Discuss different types of insulations used in cryogenics.

(5 × 12 = 60 marks)

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B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Mechanical Engineering/Production Engineering

ME 010 805 G01 }
PE 010 805 G01 } **INDUSTRIAL SAFETY (Elective IV) [ME, PE]**

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 3 marks.

1. Write most relevant *five* sentences about OSHA Act.
2. What are the major causes of accidents ?
3. Differentiate between the two types of safety inspection.
4. What is meant by ventricular fibrillation ?
5. Differentiate between the various types of fires.

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. List down the ten axioms of safety philosophy.
7. Present arguments to claim that "accident proneness" is a misleading expression.
8. What is meant by "incident recall technique" ? Where and how it is used ?
9. Explain the conditions necessary for dust explosion.
10. What are the factors affecting ignition temperature of a fuel ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.

Each question carries 12 marks.

11. Explain the various steps involved in developing an effective safety plan in an industrial organization.

Or

12. Discuss on the necessary personal characteristics of a safety director in an organization.

13. Discuss on the indirect (uninsured) costs of accidents.

Or

14. Explain four methods of accident prevention.

15. What is meant by environmental audits? What are the types and what are the users?

Or

16. What is Job Safety analysis? Explain the various steps involved in doing it.

17. Discuss on the principles of manual material handling to avoid possible injuries.

Or

18. Discuss on the mechanical, physical, chemical and biological causes of occupational dermatitis.

19. Discuss on the fire risk of metals.

Or

20. Discuss on dry chemical fire extinguishing agents with their advantages and disadvantages.

(5 × 12 = 60 marks)