

G 5099

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Seventh Semester

Branch : Mechanical Engineering/Automobile Engineering

INDUSTRIAL ENGINEERING (MU)

(Improvement/Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 4 marks.

1. Define productivity. How it is measured ?
2. State the objectives of value analysis.
3. What is a product layout ? Explain with an example.
4. "Material handling does not add value to the product. But adds to the cost". Comment ?
5. Discuss the importance of motion economy.
6. What do you mean by job evaluation ? Explain its importance.
7. Briefly explain quality circles concept.
8. Point out the applications of ergonomics.
9. What do you understand by economic order quantity in Inventory control ?
10. Briefly explain destructive and non destructive testing using examples.

(10 × 4 = 40 marks)

Part B

Answer all questions.

Each question carries 12 marks.

11. (a) Briefly explain the functions of Industrial engineer in an organisation.

Or

- (b) Define productivity index factor. Describe various techniques used for improving productivity.

12. (a) Discuss the characteristics of good plant layout.

Or

- (b) What are the important material handling equipments commonly used in Industries ? Explain briefly.

Turn over

13. (a) Describe various stages of method study. Also make a left and right hand operation chart for filling ink in a foundation pen.

Or

(b) Define merit rating. State and describe the various methods of merit rating.

14. (a) Define accident. State the causes of Industrial accidents and suggest practical measures to minimize them.

Or

(b) Define ergonomics. State the principles to ergonomics of posture and movement.

15. (a) Describe the effect of increase or decrease in sales price on B.E.P. with the help of neat sketches.

Or

(b) Define inventory. Describe (i) direct inventories ; (ii) Indirect inventories with suitable examples.

(5 × 12 = 60 marks)

G 5108

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Seventh Semester

Branch—Mechanical Engineering/Automobile Engineering

REFRIGERATION AND AIR CONDITIONING (MUL)

(Improvement/Supplementary)

Time : Three Hours

Maximum : 100 Marks

Use of Refrigeration and Air Condition Tables, Charts and Steam Tables are permitted.

Part A

Answer all questions.

Each question carries 4 marks.

1. Differentiate between a heat pump and refrigerator.
2. What is Ice Refrigeration?
3. Give the circuit diagram and P-h diagram for vapour compression refrigeration system with regenerative heat exchanger.
4. What is meant by undercooling in a vapour compression system?
5. Explain the working of a Vortex tube.
6. Compare and contrast between vapour compression and vapour absorption refrigeration system.
7. Draw the schematic diagram of a Thermostatic Expansion Valve and name the relevant parts.
8. What are flooded evaporators ?
9. Write notes on cooling and dehumidification.
10. What is meant by indoor air quality in Air Conditioning?

(10 × 4 = 40 marks)

Part B

Answer all questions.

Each full question carries 12 marks.

11. (a) Explain the steam jet refrigeration system with a neat sketch. (6 marks)
- (b) How is the freezing of the moisture in the air in a air-refrigeration system can be prevented. (6 marks)

Or

Turn over

12. In a Reversed Carnot refrigeration system of 1 TR cooling capacity running on perfect gas, heat is absorbed at -10°C . and rejected at 50°C . Find the states at all the points of the cycle, heat transfer and work done in all the processes, mass flow rate, volume flow rates and the COP. The maximum pressure ratio is 5 and the pressure at inlet to the isentropic compressor is standard atmospheric pressure. Take $C_p = 1.005\text{ kJ.kg-K}$ and $\gamma = 1.4$. (12 marks)

13. Explain different methods of improving COP of a simple vapour compression refrigeration cycle. (12 marks)

Or

14. An ammonia ice plant operates between a condenser temperature of 35°C and an evaporator temperature of -15°C . It produces 10 tons of ice per day from water at 30°C . to ice at -5°C . Assume simple saturation cycle. Using only table of properties of ammonia, determine :

- The capacity of the refrigeration plant,
- The mass flow rate of refrigerant,
- The discharge temperature,
- The compressor cylinder diameter and stroke if its volumetric efficiency is $\eta_v = 0.65$ r.p.m., $N = 1200$ and stroke/bore ratio $L/D = 1.2$,
- The horse power of the compressor motor if the adiabatic efficiency of the compressor $\eta_a = 0.85$ and mechanical $\eta_m = 0.95$, and
- The theoretical and actual COP.

(12 marks)

15. Explain the working principle of Lithium Bromide — water absorption system with a neat sketch. (12 marks)

Or

16. (a) Write briefly about the thermoelectric refrigeration. (6 marks)
 (b) Under what circumstance is steam jet refrigeration system more preferable over other systems? Mention the disadvantages of steam jet system over other systems. (6 marks)

17. Explain the operation of multistage reciprocating compressor. Discuss its constructional features. (12 marks)

Or

18. What are the factors to be considered in the selection of a condenser for a refrigeration system? List the advantages and disadvantages of air cooled condensers over water cooled condensers. (12 marks)

19. (a) What is meant by Effective temperature? (6 marks)
 (b) Discuss year round air conditioning system with a neat schematic showing all the elements. (6 marks)

Or

20. (a) Explain air distribution system. What are the points to be preferred in air distribution system?
 (b) Write short note on the Psychrometric Chart.

(6 + 6 = 12 marks)

[5 × 12 = 60 marks]

G 5131

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Seventh Semester

Branch : Mechanical Engineering

MACHINE DESIGN AND DRAWING—I (M)

(Improvement/Supplementary)

Time : Three Hours

Maximum : 100 Marks

Answer any two from Part A and two from Part B. Suitably assume any missing data.

Part A

Each question carries 25 marks.

1. A transmission shaft carries a pulley midway between the two bearings. The bending moment at the pulley varies from 200 N-m to 600 N-m as the torsional moment in the shaft varies from 70 N-m to 200 N-m. The frequencies of variation of bending and torsional moment are equal to the shaft speed. The shaft is made of steel with ultimate stress 540 N/mm^2 , Yield point stress 400 N/mm^2 . Endurance limit of shaft is 200 N/mm^2 . Determine diameter of the shaft using a factor of safety of 2.
2. Design a cotter joint to connect two steel rods of equal diameter. Each rod is subjected to an axial tensile force of 50 kN.
3. Design a flange coupling to connect two shafts. The input shaft transmits 37.5 kW power at 180 r.p.m. to output shaft through coupling. Shock factor is 1.5. Design the coupling.
4. Design longitudinal joint for a boiler drum of internal diameter 1200 mm is to be designed to carry internal pressure of 2.2 N/mm^2 .

$$\sigma_t = 400 \text{ MPa}, \sigma_c = 600 \text{ MPa}, z = 320 \text{ MPa.}$$

(2 × 25 = 50 marks)

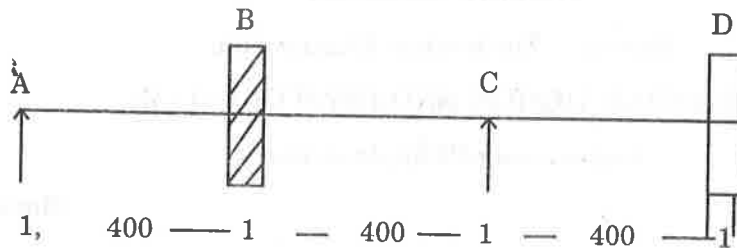
Part B

Each question carries 25 marks.

5. A railway wagon moving at a velocity of 1.5 m/s is brought to rest by a bumper consisting of two helical spring. The mass of Wagon is 1500 kg. The springs are compressed by 150 mm in bringing the Wagon to rest. The permissible shear stress for the spring wire is 625 N/mm^2 . Design the spring.

Turn over

6. A transmission shaft supporting a spur gear (B) and a pulley (D) as shown in figure. The diameters of pulley and pitch circle diameter of gear are 450 and 300 mm respectively. The pulley transmits 20 kW power to gear at 500 r.p.m. Determine the shaft diameter.



7. Design a piston for a 4 stroke diesel engine developing 15 kW power at 700 r.p.m. Other data is as follows :

Maximum pressure	=	5.1 N/mm ² .
Indicated mean effective pressure	=	0.7 N/mm ² .
Mechanical η	=	75%.
Crank radius	=	110 mm.
Heat dispersion through top	=	5% heat produced.
Fuel consumption	=	0.16 kg/kW of BP/hr.
Higher calorific value	=	42000 kJ/kg.

Difference between temperature at center and edge of piston rod = 205°C.

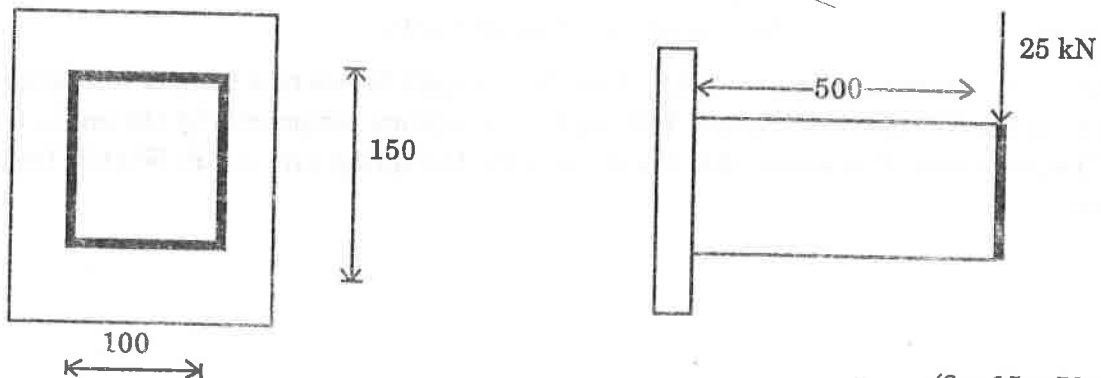
Allowable stress for piston material = 35 N/mm².

Allowable stress for piston ring material = 80 MPa.

Allowable pressure on piston barrel = 0.42 MPa.

Allowable bearing pressure for gudgeon pin = 20 N/mm².

8. A shaft of rectangular cross-section is welded to a support by means of fillet welds. Determine the size of weld if the permissible shear stress in the weld is limited to 75 N/mm².



(2 × 25 = 50 marks)

G 5149

(Pages : 2)

Reg. No.....

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B.TECH. DEGREE EXAMINATION, MAY 2013

Seventh Semester

Branch : Mechanical Engineering

WELDING TECHNOLOGY (Elective I)—(M)

(Improvement/Supplementary)

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

Part A

Each question carries 4 marks.

1. Explain Seam welding.
2. Why fluxes are used in soldering ?
3. Sketch an oxy-acetylene torch.
4. Explain filter material in gas welding.
5. What is meant by SMAW ? Brief.
6. What are different welding symbols ?
7. What is meant by friction welding ?
8. List special welding processes.
9. What are the three zones in welding ?
10. Name the non-destructive testing methods.

(10 × 4 = 40 marks)

Part B

Each question carries 12 marks.

11. (a) Explain percussion welding and tube welding. (12 marks)

Or

 - (b) (i) How soldering differ from brazing. (6 marks)
 - (ii) Write a note on pressure welding process. (6 marks)
12. (a) Explain rightward and leftward welding techniques. (12 marks)

Or

 - (b) (i) Explain cast iron welding. (6 marks)
 - (ii) Explain Aluminium welding. (6 marks)

Turn over

13. (a) With sketch explain submerged arc welding.

(12 marks)

Or

(b) (i) Explain T/G welding process.

(6 marks)

(ii) How welding electrodes are classified ?

(6 marks)

14. (a) With neat sketch explain plasma arc welding.

(12 marks)

Or

(b) Explain laser beam welding.

(12 marks)

15. (a) Write a note on welding stresses.

(12 marks)

Or

(b) (i) Explain bend test.

(6 marks)

(ii) Explain impact test.

(6 marks)

[5 × 12 = 60 marks]

G 5152

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Seventh Semester

Branch : Mechanical Engineering

MARKETING AND SALES MANAGEMENT (Elective I) (M)

(Improvement/Supplementary)

Maximum : 100 Marks

Time : Three Hours

Answer all questions.

Part A

Each question carries 4 marks.

1. Define marketing. Explain the modern concept of marketing.
2. Describe marketing mix with its basic elements.
3. What is strategic planning ?
4. Write short note on SWOT analysis.
5. What are 'five step process' in new product development ?
6. What is meant by cross cultural behaviour ?
7. What is reference groups ?
8. Briefly describe conjoint analysis.
9. What is personal selling ?
10. What are the major objectives of conducting training for sales force.

(10 × 4 = 40 marks)

Part B

Each question carries 12 marks.

11. (a) Explain the techniques of marketing research.

Or

- (b) Briefly explain the following terms :

(i) Market segmentation ;

(ii) Marketing mix.

12. (a) Discuss in detail the steps involved in strategic planning process.

Or

- (b) Discuss the importance of strategic planning and controlling modern business.

Turn over

13. (a) Explain product life cycle and its different stages.

Or

(b) Explain the various interpretations of the term "New product". Discuss the different pricing strategies available to a product manager for a new product.

14. (a) Explain the various factors which influence consumer behaviour with relevant examples.

Or

(b) Explain various stages of consumer buying process.

15. (a) Discuss the steps involved in conducting Recruitment and selecting in a systematic way.

Or

(b) What is sales management ? Discuss its features.

[5 × 12 = 60 marks]

B.TECH. DEGREE EXAMINATION, MAY 2013

Seventh Semester

Branch : Mechanical Engineering

GAS DYNAMICS AND JET PROPULSION (M)

(Improvement/Supplementary)

Time : Three Hours

Maximum : 100 Marks

Use of Approved Gas Tables and Charts are permitted.

Part A

Answer all questions.

Each question carries 4 marks.

1. Derive Karman's rule for supersonic flow in the following form $\alpha = \sin^{-1} \left(\frac{1}{M} \right)$.
2. Starting from continuity and momentum equation, derive the expression for the velocity of sound in a perfect gas, in terms of Characteristic Gas Constant and Static Temperature.
3. State the assumptions made while deriving equations for flow through a duct in isentropic flow.
4. Write down the equation relating velocity change with respect to cross-sectional area change in isentropic flow and analyse the same for a convergent-divergent nozzle and diffuser.
5. Show that the Mach Number is unity at the point of maximum entropy on the Fannoline.
6. State the assumptions made while deriving Rayleigh flow equations.
7. Explain the effect of the occurrence of shock on flow parameters in a convergent-divergent nozzle.
8. Write notes on Rayleigh's Supersonic Pitot tube formula.
9. List out the major advantages of turbojet engines.
10. What are the properties of solid propellants? (10 × 4 = 40 marks)

Part B

Answer all questions.

Each question carries 12 marks.

11. (a) Define Compressibility Factor. What is the effect of Mach Number on the compressibility factor? (6 marks)

Turn over

- (b) Show that for sonic flow, the deviation between the compressible and incompressible flow values of the compressibility factor of a perfect gas ($\gamma = 1.4$) is about 27.5 per cent.

(6 marks)

Or

12. (a) Derive Euler's momentum equation and hence deduce Bernoulli's equation for compressible fluid flow.

(6 marks)

- (b) The conditions of an air stream at entry to a duct are $P_1 = 1.0$ bar, $T_1 = 300$ K., $M_1 = 1.3$. If the Mach number at the exit of the duct is 0.6, determine for adiabatic flow the temperature and velocity of air at the duct exit.

(6 marks)

13. With the help of sketches, explain the behaviour of flow in convergent nozzles and convergent-divergent nozzles, when they are operated under off-design pressure ratios.

(12 marks)

Or

14. A stream of air flowing in a duct is at a pressure of 1.5 bar, has a Mach number of 0.6 and flows at a rate of 0.2 kg./sec. The cross-sectional area of the duct is 6 cm.². Compute the stagnation temperature of the stream. What is the maximum percentage reduction in area which could be introduced without reducing the flow rate of the stream? For this maximum area reduction, find the velocity and pressure. Assume isentropic flow.

(12 marks)

15. A circular duct passes 8.25 kg./sec. of air at an exit Mach number of 0.5. The entry pressure and temperature are 3.45 bar and 38° C. respectively and the coefficient of friction is 0.005. If the Mach number at entry is 0.15, determine (a) the diameter of the duct, (b) length of the duct, (c) pressure and temperature at exit, and (d) stagnation pressure loss.

(12 marks)

Or

16. A combustion chamber in a gas turbine plant receives air at a temperature of 350 K., pressure 0.55 bar and a velocity of 75 m./sec. The air-fuel ratio is 29 and the calorific value of the fuel is 41.87 MJ/kg. Taking $\gamma = 1.4$ and $R = 0.287$ kJ/kg.-K. for the gas, determine :

- the initial and final Mach numbers,
- final pressure, temperature and velocity of the gas,
- percent stagnation pressure loss in the combustion chamber, and
- the maximum stagnation temperature attainable.

(12 marks)

17. Derive the Rankine-Hugoniot relation for a normal shock wave in the following form :

$$\frac{P_y}{P_x} = \left\{ \frac{\left(\frac{r+1}{r-1} \right) \frac{\rho_y}{\rho_x} - 1}{\left(\frac{r+1}{r-1} \right) - \frac{\rho_y}{\rho_x}} \right\}$$

Compare the density after shock with the value of isentropic compression for the same pressure ratio.

(12 marks)

Or

18. (a) Derive the following relation for flow through a normal shock :

$$\frac{P_y}{P_x} = \left(\frac{2r}{r+1} \right) M_x^2 - \left(\frac{r-1}{r+1} \right)$$

(6 marks)

- (b) Air at a Mach number of 1.8, pressure 0.8 bar and temperature 373 K. passes through a normal shock. Determine its density after the shock. For air, take $\gamma = 1.4$ and $R = 0.287$ kJ/kg.-K.

(6 marks)

19. (a) Define specific thrust, propulsive efficiency and thrust power with reference to a turbojet engine.

(3 marks)

- (b) Draw the sketch of a pulse jet engine and explain its working principle. What are the main advantages and disadvantages?

(9 marks)

Or

20. With the help of neat sketches, explain the working principle of Liquid propellant rocket engines and solid propellant rocket engines.

(12 marks)

[5 × 12 = 60 marks]