G 2201 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2010

Sixth Semester

Branch : Mechanical/Automobile

HEAT AND MASS TRANSFER (MU)

(Regular—2007 admissions ; Supplementary—Prior to 2007 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

1. Derive the equation for heat transfer through a cylinder.
2. What is the physical significance of Fourier and Biot numbers ?
3. Explain effectiveness and efficiency of a Fin.
4. What is meant by boundary layer thickness ?
5. What is fouling resistance in heat exchangers ?
6. How are heat exchangers classified ?
7. How does radiation differ from conduction and convection ? State Stefan-Boltzmann law of thermal radiation.
8. Explain the concept of a Block body.
9. What are the applications of Mass transfer ?
10. State Fick's law of diffusion. What are the limitations of this law ?

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. (a) Explain heat conduction through a wall on resistance concept. (4 marks)

    (b) An exterior wall of a house consists of a 10.16 cm. layer of common brick having thermal conductivity 0.7 W/m K. It is followed by a 3.8 cm. layer of gypsum plaster with thermal conductivity of 0.48 W/m K. What thickness of loosely packed rockwool insulation. (k = 0.065 W/m K) should be added to reduce the heat loss through the wall by 80 %.

(8 marks)

Or

12. Derive the general 3-dimensional heat conduction equation in cylindrical co-ordinates. Assume the material is homogeneous isotropic continua.

Turn over

13. Water flows inside a tube 5 cm. in diameter and 3 m. long at a velcoity of 0.8 m/s. Determine the heat transfer coefficient and the rate of heat transfer if the mean water temperature is 50° C. and the wall is isothermal at 70° C. For water at 60°C. take $k = 0.66$ W/m K, $\upsilon = 0.478 \times 10^{-6}$ m^2/s and Pr = 2.98.

Or

14. Considering flow over a flat plate, define the velocity and thermal boundary layer thicknesses. Discuss.

15. (a) Explain the operation counter flow heat exchanger with a help of temperature length of heat exchanger graph. Write the expression for LMTD for this heat exchanger.

(4 marks)

(b) Hot oil with a capacity rate of 2500 W/K flows through a double pipe heat exchanger. It enters at 360° C. and leaves at 300° C. Cold fluid enters at 30° C. and leaves at 200° C. If the overall heat transfer coefficient is 800 W/m.^{2}K, determine the heat exchanger area for counter flow configuration.

(8 marks)

Or

16. A thin walled concentric tube heat exchanger is used to cool engine oil from 160° C. to 60° C. and water, which is available at 25° C. acts as a coolant. The oil and water flow rates are each 2 kg./s. and the diameter of the inner tubes is 0.5 m. and corresponding value of overall heat transfer coefficient is 250 W/m.^{2}K. Determine the length of heat exchanger to accomplish the desired cooling. Take C_p of water and engine oil as 4.187 and 2.035 kJ/kg. K respectively.

17. A long steel rod, 2 cm. diameter is to be heated from 425° C. to 550° C. It is placed concentrically in a long cylindrical furnace which has an inside diameter of 15 cm. The inner surface of the furnace is at a temperature of 1000° C. and has an emissivity of 0.85. If the surface of the rod has an emissivity of 0.6 find the time required for the heating operation. Take density of steel, $\rho = 7845$ kg./m.^{3} and specific heat, $c = 0.67$ kJ/kg. K.

Or

18. An electrically heated plate 15 cm. high and 10 cm. wide is maintained at 140° C. Estimate the rate of heat dissipation from both sides of the plate in an atmosphere at 20° C., if the radiation heat transfer coefficient is 8.72 W/m.^{2} K. For air at the mean temperature of 80° C., take $\upsilon = 21.09 \times 10^{-6}$ m.^{2}/s, Pr = 0.692 and K = 0.0305 W/m-K.

19. Explain the various regimes of saturated pool boiling.

Or

20. A 30 mm. deep pan is filled with water to a level of 15 mm. and is exposed to a dry air at 40° C. Assuming the mass diffusivity as 0.25×10^{-4} m.^{2}/s., calculate the time required for all water to evaporate.

(5 × 12 = 60 marks)

G 2210 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2010

Sixth Semester

Branch : Mechanical Engineering

PRINCIPLES OF MANAGEMENT AND ENGINEERING ECONOMICS (MU)

(Regular—2007 admissions ; Supplementary—Prior to 2007 admissions)

Time : Three Hours Maximum : 100 Marks

Answer Part A and Part B in **separate** *answer-books.*

Answer **all** *questions.*

All questions carry equal marks.

Part A (Principles of Management)

1. (a) Discuss the principles of effective directing.

   (b) Define Motivation. How does it affect behaviour ? How can achievement be developed ?

Or

2. (a) Define Communication. What are its elements ?

   (b) What are the essentials of effective control system ?

3. (a) What are the sources of stress ? State the strategies to optimise stress.

   (b) How are norms and group cohesion related to performance ?

Or

4. (a) How would a Manager increase intergroup co-operation ?

   (b) What is meant by pricing ? List out pricing objectives.

5. (a) Distinguish between Public Ltd. and Private Ltd. Company.

   (b) What are the modern approaches to Quality Management ?

Or

6. (a) What is meant by Re-engineering ? Explain the steps involved in Re-engineering process.

   (b) What is meant by MBO ? Explain the steps involved in setting up MBO and its advantages.

Part B (Engineering Economics)

7. (a) Distinguish between Individual and Market demand, Total Vs. Market segmented demand.

   (b) Explain the concept of inflationary gap. What are the effects of inflation on producers and consumers.

Or

8. (a) What is meant by circular flow of income ? Explain the difficulties and problems of measurement of national income.

   (b) What is the cause for cost-push inflation ? Illustrate the cost-push inflation. State the measures to control inflation.

9. (a) What are the principal weaknesses of India's Banking System which need to be removed now ?

   (b) Why was IRBI set-up ? What are its functions ? What assistance does it provide to sick industrial units ?

Or

10. (a) Discuss the role of IDBI in financing small enterprises in India.

    (b) State and explain the various schemes introduced by UTI to meet the needs of the diverse sections of investors.

11. (a) Discuss the functions and services of a stock exchange market.

    (b) Explain the role of public sector for the development of the economy.

Or

12. (a) What is meant by underwriting of securities ? Explain the different types of underwriting.

    (b) Explain the problems faced by the Indian Stock Markets.

G 2219 (Pages 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2010

Sixth Semester

Branch : Mechanical Engineering

COMPUTER AIDED DESIGN AND MANUFACTURING

(Regular—2007 admissions)

[Supplementary—Prior to 2007 admissions]

Time : Three Hours Maximum :100 Marks

Answer **all** *questions.*

Module 1

1. (a) What is the design process ? Explain briefly the model for the design process.

(10 marks)

(b) Discuss the points to be considered for the choice and implementation of CAD. Write the applications of CAD.

(10 marks)

Or

2. (a) Explain Digital differential analyser algorithm with example.

(12 marks)

(b) Briefly explain the interactive display devices.

(8 marks)

Module 2

3. (a) Explain the term numerical control, its objectives, advantages and disadvantages.

(8 marks)

(b) Describe briefly the PLC ladder logic programming.

(12 marks)

Or

4. (a) Explain the typical applications and advantages of PLC.

(8 marks)

(b) Describe the various elements of the Numerical Control System.

(12 marks)

Turn over

Module 3

5. (a) Explain the steps involved in manual part programming. (10 marks)

(b) Discuss the most common types of tape coding systems used in the NC industry. (10 marks)

Or

6. (a) Explain briefly the APT language. (8 marks)

(b) What is computer-aided part programming ? Explain the various steps involved in this. (12 marks)

Module 4

7. (a) Explain the variant and generative CAPP systems. (12 marks)

(b) List out the benefits of Group technology. (8 marks)

Or

8. (a) Discuss in detail the use of AI in Computer aided process planning. (12 marks)

(b) Explain the criteria for selecting a CAPP system. (8 marks)

Module 5

9. (a) List the types of industrial robots and classify based on mechanical configuration. (8 marks)

(b) Explain the various drive systems used in robots. (12 marks)

Or

10 (a) Explain the different methods of robot programming. (10 marks)

(b) Briefly describe robot application in various areas. (10 marks)

G 2175 (Pages 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2010

Sixth Semester

Branch : Mechanical Engineering

MECHANICS OF MATERIALS (M)

(Regular—2007 admissions)

[Supplementary—Prior to 2007 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

1. Explain the significance of shearless plane.
2. What is Chain Link ?
3. Derive the radial and tangential components of strain in polar co-ordinates.
4. What is the significance of compatibility equations ?
5. Describe Saint Venant's principle.
6. Discuss the stresses in a thick cylinder under axisymmetric loads.
7. Explain shells of uniform stress.
8. What is Mohr's circle of strains ?
9. Discuss the use of polynomials in the solution of problems of elasticity.
10. Explain the method of determination of constants in Lamis equation for thick cylinders.

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. Derive the differential equations of equilibrium with body forces.

Or

12. Derive the expression for eccentricity for a sectional curved beam.
13. A thick cylinder of internal diameter 160 mm is subjected to an internal pressure 40 N/mm^2.If the allowable stress in the material is 120 N/mm^2, find the thickness required.

Or

Turn over

14. Using the concept of stress function, derive expressions for normal and shear stress in terms of stress function ϕ for a plane case.

15. Determine the shear stress distribution for a circular open section under bending caused by shear force. Locate the shear centre.

Or

16. Compare the maximum tensile stress in the curved part of a hook having :

    (i) Circular cross-section.

    (ii) Rectangular cross-section.

17. Derive the strain component in polar co-ordinates.

Or

18. Derive the radial and tangential stress in a compound cylinder subjected to external pressure P_0 and internal pressure P_i. Assume necessary parameters.

19. Derive Winkler-Bach formula for a trapezoidal section with usual notations.

Or

20. Explain the generalised Hooke's Law.

(5 × 12 = 60 marks)

G 2184 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2010

Sixth Semester

Branch : Mechanical Engineering

METROLOGY AND INSTRUMENTATION

(Regular—2007 admissions ; Supplementary—Prior to 2007 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

1. Differentiate between Precision and Accuracy.
2. What are the fundamental optical principles in the design of precision measuring equipment ?
3. Discuss in detail about the principle of clinometers.
4. What do you mean by sprit level ?
5. Define the principle of operation of optical flat.
6. What is optical interferometry ? List out its types.
7. Draw gear tooth Vernier and write short notes on tooth thickness measurement.
8. What are the elements to be checked to check the gear tooth ?
9. Enumerate the methods of calibration of accelerometers.
10. Differentiate between vibrometers and Beckwith accelerometers.

(10 × 4 = 40 marks)

Part B

11. Explain the pneumatic comparator with neat sketch.

Or

12. Describe the line and end measurement, how to make conversion from line standard to end standard.

13. Describe in detail about autocollimeter with neat sketch.

Or

14. Explain two types of taper measuring instruments.

15. Describe in detail about photoelectric microscope with neat sketch.

Or

16. Explain in detail about mechanical roughness instrument.

17. Briefly describe the external screw thread measurement.

Or

18. Describe the tooth thickness of the pitch line and the constant chord method for tooth thickness measurement.

19. Explain in detail about optical pyrometry.

Or

20. Explain about the calibration of flow measuring devices.

(5 × 12 = 60 marks)

G 2193 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2010

Sixth Semester

Branch : Mechanical Engineering

THERMAL ENGINEERING—II (M)

(Regular—2007 admissions ; Supplementary—Prior to 2007 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

1. Write short notes on Octane number of fuel.
2. Classify the IC engines based on method of ignition and compare.
3. What is meant by valve overlap and why is it provided for four-stroke IC engine ?
4. Write short notes on engine cooling.
5. Define flash and fire points.
6. Discuss the general objectives in designing combustion chamber for SI engines.
7. What are the factors affecting the delay period of CI engine combustion ?
8. The mechanical efficiency of single cylinder four-stroke engine is 80 %. The frictional power is estimated to be 25 kW. Calculate the indicated power and brake power.
9. How does the catalytic converter work ?
10. Mention the bad effects of emissions from IC engines.

(10 × 4 = 40 marks)

Part B

1. (a) Explain the operation of four-stroke diesel engine with relevant sketches.

Or

(b) (i) Write short notes on rating of CI engine fuels. (4 marks)

(ii) Explain the effect of dissociation on maximum temperature and brake power in fuel-air cycle. (8 marks)

2. (a) Explain the operation of fuel injection pump for the diesel engine.

Or

(b) Discuss about the following :—

(i) Lubrication system. (6 marks)

(ii) Ignition system. (6 marks)

Turn over

3. (a) What is meant by abnormal combustion ? Explain the phenomenon of knock in SI engines.

Or

(b) Discuss in detail about effect of engine variables on knock in SI engines under the following headings :—

(i) Density factors.

(ii) Time factors.

(iii) Composition factors.

4. (a) Explain the process of combustion in Diesel engines and explain various stages of combustion.

Or

(b) Explain the design of combustion chambers in CI engines.

5. (a) The output of an IC engine is measured by a rope brake dynamometer. The diameter of the brake pulley is 750 mm. and rope diameter is 50 mm. The dead load on the tight side of the rope is 400 N and the spring balance reading is 50 N. The engine consumes 4.2 kg./hr. of fuel at rated speed of 1000 r.p.m. The calorific value of the fuel is 43900 kJ/kg. Calculate the bsfc and brake thermal efficiency.

Or

(b) (i) Explain the purpose of heat balance test for an engine. (6 marks)

(ii) Describe about particulate emissions of CI engines. (6 marks)

[5 × 12 = 60 marks]