F 9372 (Pages : 2) Reg. No.....ME

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Sixth Semester

Branch : Mechanical Engineering

MECHANICS OF MATERIALS (M)

(2002 Admissions onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Write down the equation for equilibrium for a three dimensional elasticity problem.
2. Prove the relation $\sigma_x = -E_y\left(\frac{1}{r} - \frac{1}{r_0}\right)$ with usual notations for a curved beam.
3. Define Strain energy. Write down an equation for strain energy per unit volume.
4. Write down the expressions for strain components in polar co-ordinate system.
5. Describe Saint Venant's principle.
6. Define stress at a point. Show how it is mathematically represented.
7. Write down the equation of equilibrium of a rotating cylinder. Also write the stress strain relations.
8. Discuss the use of polynomials in the solution of elasticity problems.
9. Write down the equation for tangential strain in a thick cylinder.
10. Explain photoelastic technique for the measurement of stress.

(10 × 4 = 40 marks)

Part B

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

11. Investigate what type of plane stress is solved by the stress function

$$\phi = \frac{3F}{4C}\left(xy - \frac{xy^3}{3C^2}\right) + \frac{P}{2}y^2.$$

Or

12. Write down the six equations for compatibility. What is the use of these equations ?

Turn over

13. At a point P, the rectangular stress components are $\sigma_x = 1, \sigma_y = -2,\ \sigma_z = 4,\ \tau_{xy} = 2,\ \tau_{yz} = -3$ and $\tau_{xz} = 1$. All in units of KPa. Find the principal stress and check its invariance.

Or

14. If the rectangular components of stress a point is given by :

$$\sigma = \begin{bmatrix} a & 0 & d \\ 0 & b & e \\ d & e & c \end{bmatrix}.$$

Determine the unit normal of a plane parallel to the z -axis on which the resultant stress vector is tangent to the plane.

15. Derive the equation of equilibrium in polar co-ordinate system.

Or

16. Write down the equation of stress components in polar co-ordinates in terms of a stress function. Also write down an equation for compatibility for this case in terms of stress function.

17. Using stress function, derive the equations for radial and tangential stress a function of radius in a thick cylinder subjected to an internal pressure $-P_i$ and external pressure $-P_0$.

Or

18. Derive the equation of radial stress variation in a spherical shell subjected to an internal pressure $-P_i$.

19. Derive Winkler-Bach formula.

Or

20. Describe about different experimental techniques used for studying stress and strain.

(5 × 12 = 60 marks)

F 9381 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Sixth Semester

Branch : Mechanical Engineering/Automobile Engineering

METROLOGY AND INSTRUMENTATION (MU)

(2002 Admissions onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Explain the methods of direct and indirect measurement.
2. Define with examples, absolute and relative errors.
3. Differentiate between null and deflection methods of measurement.
4. What do you mean by wringing of slip gauges ? Explain with sketches.
5. Differentiate between circular and total run outs.
6. State the Taylor's principle for limit gauges.
7. What is a comparator ? Name the different types of comparators.
8. Explain interferometer.
9. Explain the use of a plug gauge.
10. Explain the calibration procedure of pressure gauges.

(10 × 4 = 40 marks)

Part B

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

11. Explain the different types of control charts with suitable examples.

Or

12. Explain in detail the hole and shaft based system of fits and tolerances.
13. Explain the method of finding the cylindricity error using *v*-blocks and dial gauges.

Or

14. What is a bevel protractor ? Explain with suitable sketches, the use of bevel protractor for measuring various angles.

Turn over

15. Explain the working of a Taylor-Hobson Talysurf with necessary sketches and circuit diagrams.

Or

16. Distinguish with detailed examples the R_a and R_z values for surface finish measurement.

17. Suggest a suitable method and instrument for checking the pitch of a ring thread gauge.

Or

18. Explain the various sources of errors in manufacturing gears. How can these errors be detected ?

19. Explain the working of a Froude's dynamometer with neat sketches.

Or

20. What do you mean by signal conditioning ? What are the major signal conditioning methods ?

(5 × 12 = 60 marks)

F 9407 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Sixth Semester

Branch : Mechanical Engineering / Automobile Engineering

PRINCIPLES OF MANAGEMENT AND ENGINEERING ECONOMICS (MU)

(2002 Admissions onwards—Supplementary)

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 role of motivation in achieving company objectives.

   (b) Define Controlling. How does it help to achieve objectives ?

Or

2. (a) What is line organization? What are its advantages and disadvantages ?

   (b) What are the steps involved in organization structure design ?

3. (a) What is group cohesiveness? How it is related to performance ?

   (b) Explain pricing policies and strategies.

Or

4. (a) Explain types of groups .What are the advantages and disadvantages of groups ?

   (b) What is sales force training ? Bring out its significance in sales force development.

5. (a) Explain straight piece rate system. What are its advantages and disadvantages ?

   (b) Distinguish between public sector and private sector companies.

Or

6. (a) Define MBO. What are the steps in setting up MBO ?

   (b) Distinguish between joint sector and cooperative sector companies.

Part B (Engineering Economics)

7. (a) What are the causes of inflation and discuss the fiscal measures to control the same.

   (b) What is Tax ? Explain the classification of Taxes.

Or

Turn over

8. (a) Explain Demand curve and Law of Demand.

   (b) Explain in detail the concept of inflationary gap.

9. (a) What are the functions of IDBI? How does it help sick industrial units ?

   (b) Discuss the role of IDBI in the development of Indian economy and growth.

Or

10. (a) Explain the various schemes introduced by UTI to meet the needs of the investors.

   (b) Explain the role of RBI in Indian economy.

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

   (b) Discuss the role of commercial banks in supporting small enterprises in India

Or

12. (a) Explain the role of private sector companies for the development of the economy.

   (b) Explain the different types of underwriting with reference to Indian context.

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Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Sixth Semester

Branch : Mechanical Engineering / Automobile Engineering

COMPUTER AIDED DESIGN AND MANUFACTURING (MU)

(2002 Admissions onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer all questions.

Module I

1. (a) Describe the working techniques of LCD and plasma display devices.

   (b) Describe different types of transformation operators in homogeneous coordinate system.

Or

2. (a) Describe advantages and disadvantages of different 3D modeling techniques.

   (b) Describe the role of computer applications in various stages of design procedure.

Module II

3. (a) Write notes on :

   (i) Mechines zero point. (ii) Home position.

   (iii) Tool reference. (iv) Program zero.

   (v) Contouring.

   (b) Write notes on :

   (i) Encoders. (ii) Resolvers.

   (iii) Synchro. (iv) Inductosin.

   (v) Optical grating

Or

4. (a) Write notes on :

   (i) Stepper motors. (ii) Recirculating ball screws.

   (iii) Feedback systems. (iv) CNC cutters.

   (b) Discuss application of PLCs in a tire manufacturing company.

Module III

5. (a) Describe with examples :

   (i) Fixed sequential format. (ii) Tap sequential format.

   (iii) Word address format. (iv) Modal and non modal commands.

   (b) Write a CNC program to generate a cone section from a cylindrical billet.

Or

6. (a) What are different information need for making a CNC program ?

   (b) Write notes on :

   (i) Linear interpolation. (ii) Circular interpolation.

   (iii) Caned cycles.

Module IV

7. (a) Discuss the application of Al in process planning.

   (b) Discuss the benefits of group technology.

Or

8. (a) Discuss various stages evolved in the area of process planning.

   (b) Discuss basic structure of Optiz system of part classification and coding.

Module V

9. (a) Discuss different methods to program a robot.

   (b) Discuss different types of robots used in an automobile industry.

Or

10. (a) Discuss different classification of robot sensors.

    (b) Draw neat sketch and explain the functions of vision system of assembly line robots.

(5 × 20 = 100 marks)

F 9398 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Sixth Semester

Branch : Mechanical Engineering / Automobile Engineering

HEAT AND MASS TRANSFER (MU)

(2002 Admissions onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Use of Heat and Mass transfer data book is permitted.

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

1. Write the Fourier rate equation for heat transfer by conduction. Give the units and physical significance of each term appearing in this equation.
2. How does a fin enhance heat transfer at a surface ? Give some practical examples of use of fin in heat transfer ?
3. Differentiate between mechanisms of heat transfer by free and forced convection. Mention some of the areas where these mechanisms are predominant.
4. What is a dimensionless number ? How and why are they used in heat transfer ?
5. What is a heat exchanger ? How heat exchangers are classified ?
6. Show the temperature variation along the length of a heat exchanger, when hot and cold fluids flow in parallel and counter flow fashion ?
7. What do you understand by a black body and a grey body as applied to radiation problems ?
8. Define monochromatic and total emissive power. How is the later related to the absolute temperature ?
9. Define the process of mass transfer and list some industrial applications where mass transfer is involved.
10. How does filmwise condensation differ from dropwise condensation ?

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. (a) Derive the general 3 dimensional heat conduction equation in cylindrical coordinates for a homogeneous material.

Or

(b) The interior of a refrigerator has inside dimensions 60 cm × 45 cm base area and 120 cm. high. The composite wall is made of two 3 mm. mild steel sheets (k = 145 kJ / m-hr-deg) with 6 cm. of glass wool (k = 0.188 kJ/m-hr-deg) insulation sandwiched between them. The average values of convective heat transfer coefficients at the interior and exterior wall are 40.8 and 52.3 kJ/m^2-hr-deg respectively, (i) Calculate the individual resistance of this composite wall and the resistances at the surfaces, and the overall conductance (ii) Draw the thermal circuit (iii) For the air temperature inside the refrigerator at 6.5° C and outside of 25° C determine the rate at which heat must be removed from the refrigerator. Also, calculate the temperature on the outer surface of the metal sheet.

12. (a) Explain in detail the mechanism of free convection. Show by dimensional analysis that for problems involving free convection, the Nusselt number can be expressed as a function of Prandtl number and Grashof number.

Or

(b) Atmospheric air at 30°C temperature and free stream velocity of 2.5 m/s flows along the length of a flat plate maintained at a uniform surface temperature of 90°C. The length, width and thickness of the plate is 100 cm., 50 cm. and 2.5 cm. If the thermal conductivity of the plate material is 25 W/m-deg, make calculations for (i) heat lost by the plate (ii) temperature of bottom surface of the plate for steady state conditions.

13. (a) A counter flow heat exchanger is used to cool 2000 kg/hr of oil (C_p= 2.5 kJ/kg K) from 105°C to 30°C by the use of water entering at 15°C. If the overall heat transfer coefficient is expected to be 1.5 kW/m^{2}K , make calculations for the water flow rate, the surface area required and the effectiveness of heat exchanger. Assume that the exit temperature of the water is not to exceed 80°C. Use NTU effectiveness approach.

Or

(b) Is it better to arrange for the flow in a heat exchanger to be parallel or counter flow ? In a counter flow heat exchanger , oil (C_p= 3 kJ/kg K) at the rate of 1400 kg/hr is cooled from 100°C to 30°C by water that enters the exchanger at 20°C at the rate of 1300 kg/hr . Determine the heat exchanger area for an overall heat transfer coefficient of 3975 kJ/m^2-hr-K. Also derive a relationship between oil and water temperatures at any section of the heat exchanger.

14. (a) Discuss the following terms as applied to radiation heat transfer :

(i) Spectral and spacial distribution of energy.

(ii) Specular and diffused reflection.

(iii) Wien's displacement law.

(iv) Kirchhoff's law.

Or

(b) Derive a general relation for the radiation shape factor in case of radiation between two surfaces. Two facing parallel plates radiating only from their facing sides see only each other but the two rectangular plates meeting at right angles do not radiate solely to each other. How do you account for the variation in shape factor ?

15. (a) 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

Or

(b) Discuss in detail the various regimes in boiling and explain the condition for the growth of bubbles. What is the effect of bubble size on boiling ?

(5 × 12 = 60 marks)

F 9390

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Sixth Semester

THERMAL ENGINEERING—II (M)

(2002 Admissions onwards—Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Discuss the important qualities of an SI and CI engine fuel.
2. A good fuel for an SI engine will be a bad fuel for a CI engine. Comment.
3. What do you mean by MPFI system ?
4. What are the various desirable properties of an engine lubricant ?
5. What is meant by abnormal combustion ?
6. Define Flash point, Fire point and Viscosity index.
7. Does the flame front exist in a CI engine ? Why ?
8. What causes the knock in a CI engine ?
9. What are the major emissions that come out of engine exhaust ?
10. Why Morse test is not suitable for single cylinder engine ?

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks*

11. (a) Explain the operation of a two stroke diesel engine.

Or

(b) Write short notes about the following :

(i) Wankel engine.

(ii) Stirling engine.

(iii) VCR engine.

(4 + 4 + 4 = 12 marks)

12. (a) Explain the *two* conventional types of ignition systems that are normally used in automobiles.

Or

(b) Explain the *two* types of cooling systems and compare them.

Turn over

13. (a) Describe with suitable sketches the combustion phenomenon in SI engines.

Or

(b) Describe the phenomenon of detonation or knocking in SI engines.

14. (a) Explain with figures various types of combustion chambers used in CI engines.

Or

(b) Name some engine variables that affect the ignition delay period. Explain briefly the effect of each of them.

15. (a) Give a brief account of air pollution due to engines.

Or

(b) Explain the following :

(i) Catalytic converter.

(ii) Exhaust gas treatment.

(iii) Particulate traps.

(4 + 4 + 4 = 12 marks)

(5 × 12 = 60 marks)