F 6259 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Common for all Branches

EN 010 302—ECONOMICS AND COMMUNICATION SKILLS

(AI, AN, AU, CE, CS, EC, EE, EI, IC, IT, ME, MT, PE and PO)

(New Scheme—Regular/Improvement/Supplementary/)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. Mention any *six* Nationalised Banks.
2. What do you mean by an MNC ?
3. Explain the merits of direct tax.
4. Discuss the reasons for inflation.
5. What is TRIPS and TRIMS ?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Discuss the importance of mutual funds.
7. Distinguish between Direct and Indirect taxes.
8. Explain the steps involved in tax evasion.
9. What is meant by demand pulls and cost push effects of inflation ?
10. Comment on the international trade systems.

(5 × 5 = 25 marks)

Part C

Each question carries 12 *marks.*

11. Explain the major roles of small scale industries (SSI).

Or

12. What are the problems facing by Indian stock markets (BSE and NSE) ?

Turn over

13. Discuss the effects of MNC's in the Indian economy.

Or

14. Explain the Government of Indian's policy on LPG. (Liberalisation Privatisation and Globelisation).

15. Explain the problems associated with deficit financing.

Or

16. What are the functions of tax system in India ? Discuss different types of indirect taxes.

17. Write notes on the following :

    (a) GNP.

    (b) NNP and

    (c) NI.

Or

18. Explain the methods of estimating National Income.

19. Explain the imparts of WTO decisions on Indian industry.

Or

20. Explain the different aspects of BOP (Balance of payments).

(5 × 12 = 60 marks)

F 6322 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Mechanical Engineering/Automobile Engineering

THERMODYNAMICS (MU)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are intensive and extensive properties ?
2. How will you define pressure using continuum concept ?
3. Does heat transfer inevitably cause a temperature rise.
4. Which is the property introduced by the first law of thermodynamics ?
5. How can a heat pump upgrade, lowgrade waste heat ?
6. What is a mechanical energy reservoir ?
7. What do you understand by exergy and anergy ?
8. Energy is always conserved, but its quality is always degraded. Explain.
9. State the principle of operation of an electrical calorimeter.
10. Why does the fusion line for water have negative slope in the phase equilibrium diagram ?

(10 × 4 = 40 marks)

Part B

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

11. Explain the characteristics of a Quasi-static process, with neat sketches and plots. Explain any *four* such processes.

Or

12. Explain the PVT system with the necessary graphs. Derive an expression of state for an ideal gas.

Turn over

13. A reciprocating air compressor takes in $2m^3$/min at 0.11 MPa, 20° C which it delivers at 1.5 MPa, 111° C to an after cooler where the air is cooled at constant pressure, to 25° C. The power absorbed by the compressor is 4.15 kW. Determine the heat transfer in (a) the compressor and (b) the cooler.

Or

14. 3 kg of air kept at an absolute pressure of 100 KPa and temperature of 300 K is compressed polytropically untill the pressure and temperature become 1500 KPa and 500 K respectively. Evaluate the polytropic exponent, the final volume, the work of compression and the heat interaction.

15. State and explain the Carnot theorem in the context of a (a) heat pump and (b) refrigerator.

Or

16. Explain the concept of Clausius inequality.

17. Derive an expression for difference in heat capacities for an ideal gas.

Or

18. The Joule-Kelvin co-efficient μJ is a measure of the temperature change during a throttling process. A similar measure of the temperature change produced by an isentropic change of pressure is provided by the co-efficient μ_S, where

$$\mu_S = \left(\frac{\partial T}{\partial P}\right)_S$$

Prove that

$$\mu_S - \mu_J = V/C_P.$$

19. Atmospheric air at 1.0132 bar has a dbt of 32°C and a wbt of 26°C. Computer (a) the partial pressure of water vapour, (b) the specific humidity, (c) the dew point temperature, (d) the relative humidity, (e) the degree of saturation, (f) the density of the air in the mixture, (g) the density of the vapour in the mixture, and (h) the enthalpy of the mixture.

Or

20. Explain various aspects of properties of pure substances. Draw the h – s diagram for a pure substances. Give examples.

(5 × 12 = 60 marks)

F 6314 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Mechanical Engineering/Automobile Engineering

METALLURGY AND MATERIAL SCIENCE (MU)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum :100 Marks

Part A

Answer **all** *questions.*

Each question carries 4 *marks.*

1. List the methods for finding out the structure of crystals.
2. How does the packing factor influences strength of metals ?
3. How will one estimate the rate of growth of grains ?
4. List the applications of solid solutions.
5. Discuss the importance of nitriding.
6. What are the techniques of grain size reduction ?
7. What are the applications of magnesium ? Can it be used for high-temperature applications.
8. Differentiate between Nickel steels and Chromium steels.
9. How will you estimate crack orientation on steel surfaces ?
10. Write a note on evaluation of stress concentration.

(10 × 4 = 40 marks)

Part B

Each full question carries 12 *marks.*

11. (a) With the necessary mathematical expressions, discuss the phenomena of dislocation climb and cross slip. Explain the dislocation sources contributes to its propagation.

Or

(b) What do you mean by nucleation ? Differentiate between homogeneous and heterogeneous nucleation, with neat sketches. Discuss the dendritic growth.

Turn over

12. (a) With neat sketches, explain the recent methods of hot working of metals. Discuss the influence on these methods on grain structure refinement.

Or

(b) Explain with suitable line diagrams and graphs, the (i) eutectoid and (ii) peritectoid reaction. How this information is useful for metal working ?

13. (a) With neat diagrams, discuss any *four* surface hardening techniques.

Or

(b) Explain the different methods of material deposition. Compare their advantages and disadvantages.

14. (a) Discuss the effects of alloying elements on (i) displacement of the eutecoid point and (ii) retardation of the transformation rates.

Or

(b) Explain any *four* techniques for (i) corrosion resistance improvement and (ii) improvement of mechanical properties of metals.

15. (a) Explain the effect of the nature of a surface on fatique. Discuss the correlation between corrosion and fatigue.

Or

(b) What do you mean by slip ? How will you evaluate and quantify it ? Discuss its influence on different types of fracture mechanisms.

(5 × 12 = 60 marks)

F 6305 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Mechanical Engineering

FLUID MECHANICS (M)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What is the difference between sluice gates and lock gates ?
2. What is the effect of temperature on viscosity of water and that of air ?
3. Differentiate between free vortex and forced vortex flow.
4. List the limitations of flow nets.
5. What is a free jet of liquid ?
6. Discuss 'end contraction' of a weir.
7. Distinguish between attached flow and detached flow.
8. What is the condition for single stagnation point for a rotating cylinder ?
9. Define kinetic energy correction factor and momentum correction factor.
10. Explain the term co-efficient of friction. On what factors does this co-efficient depend ?

(10 × 4 = 40 marks)

Part B

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

11. The diameters of a small piston and a large piston of a hydraulic jack are 2 cm and 10 cm respectively. A force of 60 N is applied on the small piston. Find the load lifted by the large piston, when :
(a) The pistons are at the same level ; and (b) Small piston is 20 cm above the large piston. The density of the liquid in the jack is given as 1000 kg/m^2.

Or

Turn over

12. A wooden log of 0.6 m diameter and 5 m length is floating in river water. Find the depth of the wooden log in water when specific gravity of the log is 0.7.

13. A closed cylinder of radius R and height H is completely filled with water. It is rotated about its vertical axis with a speed of 'w' radius per second. Determine the total pressure exerted by water on the top and bottom of the cylinder.

Or

14. A source and a sink of strength 4 m^2/s and 8 m^2/s are located at $(-1,0)$ and $(1,0)$ respectively. Determine the velocity and stream function at a point P (1, 1) which is lying on the flow net of the resultant stream line.

15. What are the applications of momentum equation ? Find out an expression for the force exerted by a flowing fluid on a pipe bend.

Or

16. The maximum flow through a 300 mm diameter horizontal main pipeline is 18,200 litres / minute. A venturimeter is introduced at a point of the pipeline where the pressure head is 4.6 m of water. Find the smallest diameter of throat so that the pressure at the throat is never negative. Assume co-efficient of meter as unity.

17. What do you mean by separation of boundary layer ? Discuss the effect of pressure gradient on boundary layer separation.

Or

18. For the velocity profile for laminar boundary layer :

$$\frac{u}{U} = 2(y/\delta) - 2(y/\delta)^3 + (y/\delta)^4$$

Obtain an expression for boundary layer thickness, shear stress, drag force on one side of the plate and co-efficient of drag in term of Reynold's number.

19. Show that the momentum correction factor and energy correction factor for laminar flow through a circular pipe are 4/3 and 2.0 respectively.

Or

20. A rough pipe of diameter 400 mm and length 1000 m carries water at the rate of 0.4 m^3/s. The wall roughness is 0.012 mm. Determine the co-efficient of friction, wall shear stress, centre-line velocity and velocity at a distance of 150 mm from the pipe wall.

(5 × 12 = 60 marks)

F 6296 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Mechanical Engineering and Automobile Engineering

MACHINE DRAWING—I (MU)

(Old Scheme—Supplementary/Mercy Chance)

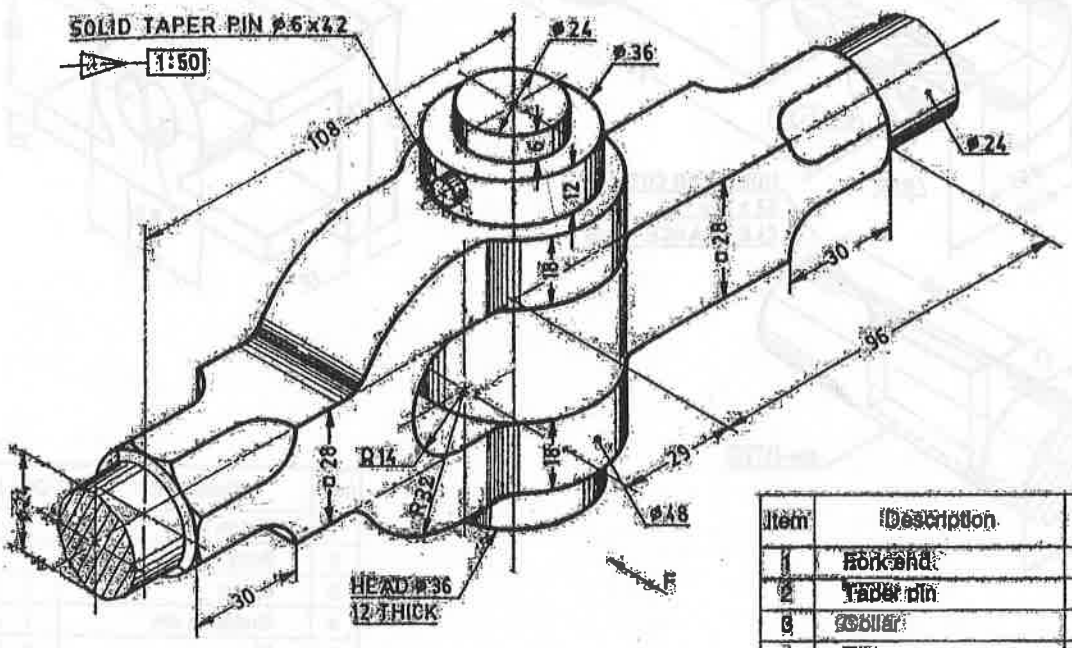
Time : Three Hours Maximum : 100 Marks

Missing dimensions, if any, may be assumed. Drawing sheets will be supplied. Answer **all** *questions.*

1. Answer any *two* of the following :—
   (a) Sketch any three locking arrangements of nuts.
   (b) Draw three views of a hexagonal nut for M 30 bolt. Insert all dimensions of the nut in terms of the bolt diameter.
   (c) Draw two views of a single riveted double strap butt joint used for joining plates of thickness 12 mm. Mark all dimensions in the drawing.

   (2 × 7½ = 15 marks)

2. An isometric view of knuckle joint is shown in Fig. 1. Draw the following views :—
   (a) Elevation, top half in section. (15 marks)
   (b) End view, looking from left side. (10 marks)



ITEM LIST

Item	Description	Qty.	Material
1	Fork end	1	M.S.
2	Taper pin	1	M.S.
3	Collar	1	M.S.
4	Pin	1	M.S.
5	Eye end	1	M.S.

KNUCKLE JOINT

Fig. 1

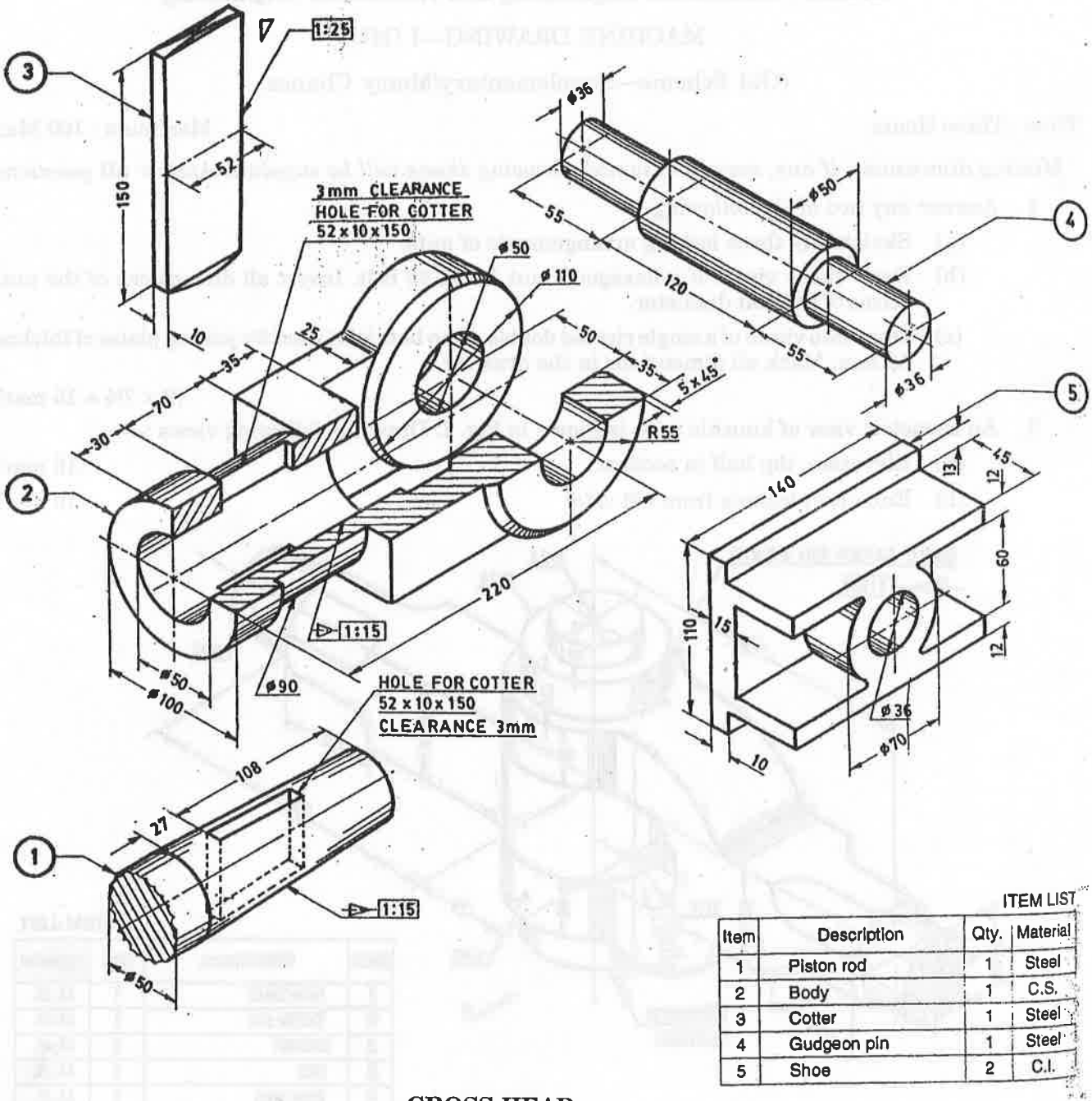
Turn over

3. Exploded views of a horizontal cross head are shown in Fig. 2. Assemble and draw the following views :

(a) Bottom half sectional elevation. (35 marks)

(b) End view. (15 marks)

(c) Plan. (10 marks)



Item	Description	Qty.	Material
1	Piston rod	1	Steel
2	Body	1	C.S.
3	Cotter	1	Steel
4	Gudgeon pin	1	Steel
5	Shoe	2	C.I.

CROSS HEAD

Fig. 2

F 6269 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Automobile Engineering/Mechanical Engineering/Production Engineering

AU 010 304 / ME 010 304 / PE 010 304—METALLURGY AND MATERIAL SCIENCE
(AU, ME, PE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What is polymorphism ?
2. Explain cross slip.
3. What is Bauschiner effect ?
4. What is the significance of grain growth ?
5. What is the importance of "size effect" ?

(5 × 3 = 15 marks)

Part B

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

6. Distinguish between directional and non-directional bonding.
7. Briefly explain the significance of Frank and Read source in metals deformation.
8. State and explain coring.
9. What are the effects of different alloying elements in HSS ?
10. Explain briefly the Griffith theory of brittle fracture.

(5 × 5 = 25 marks)

Turn over

Part C

Answer any **one** *question from each module.*
Each full question carries 12 *marks.*

Module I

11. Define the term 'Atomic packing factor'. Calculate its value for simple cube, body centred cube and face centred cube.

(12 marks)

Or

12. Explain and compare ionic, covalent and metallic bonds. (12 marks)

Module II

13. Explain : (i) Burgers vector ; (ii) Hall-Petch equation. (12 marks)

Or

14. Explain the effect of : (i) Grain size ; (ii) Grain size distribution and (iii) Grain orientation on creep resistance.

(6 + 6 = 12 marks)

Module III

15. Explain the following equilibrium diagram reactions : (i) Manotectic ; (ii) Eutectic ; and (iii) Peritectoid.

(12 marks)

Or

16. Discuss recovery, recrystallization and effect of stored energy. (12 marks)

Module IV

17. Explain the composition, micro structure, properties and applications of any three principal non-ferrous alloys.

(12 marks)

Or

18. Explain the classification of cast irons. What are their properties and applications ? (12 marks)

Module V

19. Explain the effect of plastic deformation on crack propagation. What are the various types of fractures ?

(12 marks)

Or

20. Discuss the mechanism of fatigue failure. What are the structural features of fatigue ?

(12 marks)

[5 × 12 = 60 marks]

F 6261 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Aeronautical Engineering/Mechanical Engineering/Production Engineering

AN 010 303/ME 010 303/PE 010 303—FLUID MECHANICS (AN, ME, PE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. Explain how certain insects are able to work on the surface of water.
2. What are the limitations of Bermoullis equation ?
3. In what way does the flow through a rough pipe differ from that in a smooth pipe ?
4. Differentiate between force and forced vortex.
5. What is laminar sub layer ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. State and prove Pascal's law.
7. Enumerate the various forms of energies which the Bernoullis equation takes into account.
8. What is Darcy Weisbach equation ? What is its significance ?
9. Explain Kutta-Joukowski theorem.
10. Explain displacement thickness, momentum thickness and energy thickness.

(5 × 5 = 25 marks)

Part C

Answer either (a) **or** (*b*) *of each questions.*

Each question carries 12 *marks.*

11. (a) (i) Define compressibility. Derive an expression for the compressibility for a perfect gas undergoing isothermal compression in terms of pressure.

(6 marks)

Turn over

(ii) Prove that the centre of pressure always lies below he centre of gravity on a flat plate immersed in a liquid at some angle to the free surface.

(6 marks)

Or

(b) A cylindrical tank 2m diameter and 4 m long with its axis horizontal, is half filled with water and half filled with oil of density 880 kg/m^3. Determine the magnitude and position of the net hychostatic force on one end of the tank.

(12 marks)

12. (a) Derive the Bernoullis equation for a one dimensional frictionless incompressible fluid. Discuss the significance of terms in the equation.

(12 marks)

Or

(b) A 20 cm × 10 cm venturimeter is inserted in a vertical pipe carrying oil of specific gravity 0.8, the flow of oil is in the upward direction. The difference in levels between the throat and inlet section is 50 cm. The oil mercury differential manometer gives a reading of 30 cm of mercury. Find the discharge neglect losses.

(12 marks)

13. (a) Derive Darcy's equation for determination of loss of head due to friction in pipe line. Discuss its significance.

(12 marks)

Or

(b) (i) Explain the difference between the energy line and the hydraulic gradient line in a pipe flow.

(6 marks)

(ii) A pipe, 25 cm dia × 250 m long, carries water form station A to station B which is located at a level 10 m higher. If the shear stress between the liquid and pipe wall is 25 N/m^2, calculate the pressure change in the pipe and the head lost.

(6 marks)

14. (a) (i) Define Doublet and vortex pair.

(6 marks)

(ii) Derive the equation for stream function and velocity potential function for a uniform stream of velocity V in a two dimensional field, the velocity being inclined to the x-axis at an angle α.

(6 marks)

Or

(b) In a two dimensional flow the stream function is given by $\psi = 2xy$. Calculate the velocity at a point (3, 6). Show that the velocity potential ϕ exists for this case and deduce it. Also draw the streamlines corresponding to $\psi = 100$ and $\psi = 300$.

(12 marks)

15. (a) For the velocity profile for laminar boundary layer $\frac{u}{u\alpha} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3$ Obtain an expression for boundary layer thickness, shear stress, drag force on side of the plate and co-efficient of drag in terms of Reynolds Number.

(12 marks)

Or

(b) (i) Explain the characteristics of laminar and turbulent boundary layers.

(6 marks)

(ii) Define displacement thickness. Derive an expression for the displacement thickness.

(6 marks)

[5 × 12 = 60 marks]

F 6279 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Automobile Engineering/Mechanical Engineering/
Production Engineering/Metallurgy

AU 010 305
ME 010 305
PE 010 305
MT 010 305
} PROGRAMMING IN C (AU, ME, PE and MT)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Write neat and efficient C programs wherever necessary.

Part A

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

1. List the various data types in C, giving examples for each.
2. Write appropriate type declarations to create the following :—
   (i) An array to record the weights of 60 students in a class.
   (ii) A two-dimensional array to classify students by sex and one of five occupations that the students intend to take up after the completion of their studies.
   (iii) A three-dimensional array to classify the students by age (15 years to 25 years), years of study (10 to 15 years), and one of 10 major subjects of study.
3. What are the two main components of a function definition ? Illustrate with an example.
4. What happens when a pointer to a structure is incremented ?
5. What are the two methods to update a data file ? Which is better ?

(5 × 3 = 15 marks)

Part B

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

6. Explain if, else-if and switch statements with suitable examples.
7. Explain union with an example and state the uses of union.
8. What is recursion ? Explain with an example program.

Turn over

9. What is linked list ? Describe its functions, merits and demerits.

10. Describe two bitwise shift operators ? What requirement must the operators satisfy ? What is the purpose of each operand ?

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module I

11. (a) Describe with the help of examples, all the operators in C, specifying the hierarchy of operations.

(7 marks)

(b) What is an escape sequence ? Give an example and explain the purpose of the same.

(5 marks)

Or

12. Write a C program to compute $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots$, upto 5 decimal place correction.

Module II

13. Write a C program to search an element from a list of sorted integers using binary search method.

Or

14. Write a program to print the upper and lower triangles of a matrix.

Module III

15. Write a function to accept 10 characters and to display whether each input character is a digit, a lowercase or uppercase alphabet, or a special symbol character ? Write the main program to call it.

Or

16. Write a program to input 100 student's details as structure and display them. Structure fields (Reg.No., name, branch, semester, mark 1, mark 2, ..., mark 8, total).

Module IV

17. Write a function using pointers to add two matrices and to return the resultant matrix to the calling function.

Or

18. Write a C program to create a single linked list to read a set of N numbers and to print the list in ascending order.

Module V

19. Associate a stream pointer "point" with a new stream oriented data file called sample.dat. Open the data file so that information can either be read from or written into the file. Show how the data file can be closed at the end of the program.

Or

20. Write a C program that will receive a file name and a line of text as command line argument and write the text to the file.

(5 × 12 = 60 marks)

F 6288 (Pages : 3) **Reg. No.....**

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Automobile Engineering/Mechanical Engineering/Production Engineering/ Polymer Engineering

AU 010 306/ME 010 306/PE 010 306/PO 010 306—STRENGTH OF MATERIALS AND STRUCTURAL ENGINEERING (AU, ME, PE, PO)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. What are deformable bodies ?
2. What do you mean by pure bending ?
3. With a sketch, briefly explain an overhanging beam.
4. Define polar modulus and torsional rigidity.
5. What is the use of strain gauge rosette ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Define and explain Hooke's law for linearly elastic and isotropic material.
7. Distinguish between concentrated and uniformly distributed loading with an example.
8. Derive the flexure formula for beams. Discuss the various assumptions.
9. Differentiate between thin and thick cylinders. Explain each aspect of Lame's equation.
10. Derive the Euler's formula for long columns.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*

Each question carries 12 *marks.*

11. (a) What you mean by bars of varying cross section ? Derive expressions for :

(i) Deformation.

(ii) Stress and

(iii) Strain at various locations of any bar of a varying cross-section. (Assume suitable data if necessary).

(12 marks)

Or

(b) Derive expressions for stresses and strains due to :

(i) Normal.

(ii) Shear and

(iii) Bending loads.

Differentiate clearly between axial and shear strains.

(12 marks)

12. (a) With neat sketches, explain the features of cantilever and simply supported beams. How do you find bending moment at various loading conditions in these beams ?

(12 marks)

Or

(b) Explain the importance of the 'point of contraflexure'. Also, explain a method of determining the magnitude and nature of external load, knowing the bending moment variations. Give a step-by-step procedure.

(12 marks)

13. (a) Derive the shearing stress formula for beams. State the various assumptions. What are the limitations of this formula ? Explain different practical applications of this formula.

(12 marks)

Or

(b) (i) Derive the "moment-curvature" relation. (6 marks)

(ii) Explain the "moment area" method for finding deflection on a simple type of beam.

(6 marks)

14. (a) (i) How do you determine stresses in thick cylinders due to internal pressure ? (6 marks)

(ii) What are compound pipes ? What are their applications ? (6 marks)

Or

(b) Define and explain the torsion theory of elastic circular bars. Discuss the similarities, assumptions and limitations of solid shaft and hollow shaft for a torsion application.

(12 marks)

15. (a) Discuss with examples :

(i) Principal stresses and planes. (4 marks)

(ii) Mohr's circle representation. (4 marks)

(iii) Combined axial and torsional loads. (4 marks)

Or

(b) Derive the Rankine's formula for intermediate columns. State all the assumptions. What do you mean by eccentric loading of columns ?

(12 marks)

[5 × 12 = 60 marks]

F 6330 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Mechanical/Polymer Engineering/Automobile Engineering

STRENGTH OF MATERIALS AND STRUCTURAL ENGINEERING—(MPU)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Assume missing data if any suitably.

Part A

Each question carries 4 *marks.*

1. A steel flat plate of 10 mm thickness tapers uniformly from 100 mm to 50 mm width in a length of 400 mm. From first principles, determine the elongation of the plate if the axial tensile force is 100 kN. Take $E = 2 \times 10^5$ N/mm^2.
2. In a piece of material, a tensile stress p and shearing stress q act as a given plane. Show that principal stresses are always of opposite sign.
3. Prove that the shear force does not change at the point of application of a couple.
4. What do you mean by a beam of uniform strength and constant width ?
5. List out the methods of determining deflection of beams.
6. Define deviation, deflectance and deflection in moment area method.
7. List the assumptions for deriving deformation equation in torsion.
8. Sketch a statically indeterminate torsional member.
9. What are the different modes of failure of a column ?
10. Write a note on practical end conditions and effective length factors.

(10 × 4 = 40 marks)

Part B

Each full question carries 12 *marks.*

11. (a) A hollow steel cylinder of length 300 mm, inside diameter 150 mm and uniform wall thickness of 3 mm is filled with concrete and compressed between two rigid parallel plates at the ends by a load of 600 kN. Find the compressive stress in each material and the total shortening of the cylinder.

Take $E_s = 2 \times 10^5$ N/mm^2 and

$E_c = 0.2 \times 10^5$ N/mm^2.

(12 marks)

Or

Turn over

(b) Construct Mohr's circle for an element in pure shear 'q'. From the circle, derive the stress transformation relations. Obtain the principal stresses. What are maximum and minimum shear stresses ?

(12 marks)

12. (a) The intensity of loading on a simply supported beam of 5 m span increases gradually from 1 kN/m at one end to 2 kN/m. run on the other end. Find the position and amount of maximum bending moment. Also, draw the shear force and bending moment diagrams.

(12 marks)

Or

(b) A beam of square section is used as a beam with one diagonal horizontal. Find the magnitude and location of maximum shear stress in the beam. Also, sketch the shear stress distribution across the section.

(12 marks)

13. (a) A uniform circular bar of length 'L' extends by an amount 'δ' under a tensile pull 'P'. Show that if the bar is used as a beam simply supported at its ends and carrying a central load 'W', the maximum deflection is given by $y = \frac{W \delta L^2}{3 P d^2}$, where '$d$' is the diameter of the beam.

If $L = 80\,d$, and maximum bending stress due to 'W' is equal to 0.9 times the tensile stress due to pull 'P', find the ratio y/δ.

(12 marks)

Or

(b) A freely supported beam of span 'L' carries a central load 'W'. The sectional area of the beam is so designed that the moment of inertia of section increases uniformly from 'I' at the ends to '1.5 I' at the middle. Calculate the central deflection.

(12 marks)

14. (a) A shaft tapers uniformly from a radius $(r + a)$ at one end to $(r - a)$ at the other. If it is under the action of an, axial torque 'T' and '$a = 0.1\,r$', find the percentage error in the angle of twist for a given length when calculated on the assumption of a constant radius 'r'.

(12 marks)

Or

(b) A ship's propeller shaft transmits 7.5×10^6 W at 240 r.p.m. The shaft has an internal diameter of 15 cm. Calculate the minimum permissible external diameter if the shearing stress in the shaft is limited to 150 N/mm^2.

(12 marks)

15. (a) Find the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the columns as 2.3 m and hinged at its both ends. Take E = 205 kN/mm^2.

(12 marks)

Or

(b) Derive the Secant formula for long column under eccentric loading. State all the necessary assumptions.

(12 marks)

[5 × 12 = 60 marks]

F 6257 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Common to all Branches except C.S. and I.T.

EN 010 301 A—ENGINEERING MATHEMATICS–II (CE, ME, EE, AU, AN, EC, AI, EI, IC, PE, PO and MT)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Find the directional derivative of $\phi(x, y, z) = x y^2 + y z^3$ at the point $(2, -1, +1)$ in the direction of the vector $\bar{i} + 2\bar{j} + 2\bar{k}$.

2. Find the work done in moving a particle once around the circle $x^2 + y^2 = 4$ in the xy–plane and if the force field is given by $\bar{F} = (2x - y + 2z)\bar{i} + (x + y - z)\bar{j} + (3x - 2y + 5z)\bar{k}$.

3. Prove that $\Delta = \mu\delta + \frac{1}{2}\delta^2$.

4. Derive Simpson's $\frac{1}{3}^{rd}$ rule from Newton Cote's quadrature formula.

5. Prove that $z\{n^p\} = -z\frac{d}{dz}\{z(n^{p-1})\}$, p being a +ve integer.

(5 × 3 = 15 marks)

Part B

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

6. Find the angle between the surfaces $y = x^2 + z^2 - 5$ and $x^2 + y^2 + z^2 = 7$ at $(2, -1, 2)$.

7. Evaluate $\int_S \bar{F} \cdot \bar{n}\, dS$ where $\bar{F} = yz\,\bar{i} + zx\,\bar{j} + xy\,\bar{k}$ and S is the part of the sphere $x^2 + y^2 + z^2 = 1$ which lies in the first octant.

8. Given that $u_0 = 3$, $u_1 = 12$, $u_2 = 81$, $u_3 = 200$, $u_4 = 100$ and $u_5 = 8$. Find $\Delta^5 u_0$.

Turn over

9. Solve $y_{n+2} - 4\,y_{n+1} + 3\,y_n = 2^n + 3^n + 7$.

10. If $z\{u_n\} = \frac{z}{z-1} + \frac{z}{z^2+1}$ find the z transform of u_{n+2}.

(5 × 5 = 25 marks)

Part C

Each full question carries 12 marks.

Module I

11. (a) If $r = |\bar{r}|$ where $\bar{r} = x\,\bar{i} + y\,\bar{j} + z\,\bar{k}$ then evaluate :

(i) ∇r^n ; and (ii) $\nabla \log r$.

(6 marks)

(b) Show that $r^n\,\bar{r}$ is an irrotational vector for any value of 'n' but is solenoidal only if $n = -3$.

(6 marks)

Or

12. (a) Find div $\bar{f}$ and curl $\bar{f}$ where curl $\bar{f}$ = grad $(x^3 + y^3 + z^3 - 3\,xyz)$. **(6 marks)**

(b) Prove that $\nabla \times (\phi\,\bar{f}) = (\nabla\,\phi) \times \bar{f} + \phi(\nabla \times \bar{f})$. **(6 marks)**

Module II

13. Verify Green's theorem in the plane for $\oint_C \left[(xy + y^2)\,dx + x^2 dy\right]$ where C is the closed curve of the region bounded by $y = x$ and $y = x^2$.

(12 marks)

Or

14. Verify Stoke's theorem for the function $\bar{F} = x^2\,\bar{i} + xy\,\bar{j}$ integrated round the square in $z = 0$ plane whose sides are along the lines $x = 0, y = 0, x = a, y = a$.

(12 marks)

Module III

15. The following table gives the population in loss of a town during the last six censuses. Estimate the population during 1947 and 1987.

x :	1941	1951	1961	1971	1981	1991
y :	12	15	20	27	39	52

(12 marks)

Or

16. Evaluate u_{28}, given $u_{20} = 49225$, $u_{25} = 48316$, $u_{30} = 47236$, $u_{35} = 45926$ and $u_{40} = 44306$.

(12 marks)

Module IV

17. From the following data find the first and second order derivatives at the point $x = 1.1$.

x :	1.0	1.2	1.4	1.6	1.8	2
$f(x)$:	0	0.128	0.544	1.296	2.432	4

(12 marks)

Or

18. Evaluate $\int_0^{\pi} \sin^4 x\,dx$ correct to four places of decimals using Trapezoidal rule by dividing $(0, \pi)$ into 10 equal parts.

(12 marks)

Module V

19. Using convolution theorem find the inverse z transform of $\left(\frac{z}{z-1}\right)^3$. **(12 marks)**

Or

20. Using z transform solve :

$u_{n+2} + 4\,u_{n+1} + 3\,u_n = 3^n$ with $u_0 = 0$ and $u_1 = 1$.

(12 marks)

[5 × 12 = 60 marks]

F 6293 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Common to all branches except R and T

ENGINEERING MATHEMATICS—II (CMEPLANSUF)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Answer any **one** *full question from each module.*
Each full question carries 20 *marks.*

Module 1

1. (a) Prove that $\frac{d}{dt}\left[\vec{a}\cdot\frac{d\vec{b}}{dt}-\frac{d\vec{a}}{dt}\cdot\vec{b}\right]=\vec{a}\cdot\frac{d^2\vec{b}}{dt^2}-\frac{d^2\vec{a}}{dt^2}\cdot\vec{b}$.

(b) Find the angle between the tangents to the curve $x=t,\ y=t^2,\ z=t^3$, at $t=\pm 1$.

(c) Show that $\vec{E}=\frac{\vec{r}}{r^2}$ is irrotational.

Or

2. (a) If $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$, prove that $\nabla\cdot\left\{r\nabla\left(\frac{1}{r^3}\right)\right\}=\frac{3}{r^4}$.

(b) In what direction from $(3,1,-2)$ is the directional derivative of $\phi=x^2y^2z^4$ maximum and what is its magnitude ?

Module 2

3. (a) Find the value of $\vec{r}$ satisfying the equation $\frac{d^2\vec{r}}{dt^2}=6t\hat{i}-24t^2\hat{j}+4\sin t\,\hat{k}$, given that $\vec{r}=2\hat{i}+\hat{j}$ and $\frac{d\vec{r}}{dt}=-\hat{i}-3\hat{k}$ at $t=0$.

(b) Evaluate by stoke's theorem, $\oint_C(\sin z\,dx-\cos x\,dy+\sin y\,dz)$ where C is the boundary of the rectangle $0\le x\le\pi,\ 0\le y\le 1,\ z=3$.

Or

Turn over

4. (a) Apply Green's theorem to evaluate $\oint_C [(y - \sin x)\,dx + \cos x\,dy]$ where C is the plane triangle enclosed by the lines $y = 0, x = \pi/2$ and $y = \frac{2}{\pi}x$.

(b) If $\vec{F} = (2x^2 - 3z)\hat{i} - 2xy\hat{j} - 4x\hat{k}$, then evaluate $\iiint_V \nabla \times \vec{F}\,dV$ where V is the closed region bounded by the planes $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$.

Module 3

5. (a) Find the bilinear transformation which maps $1, i, -1$ to $2, i, -2$ respectively. Find the critical and fixed points of the transformation.

(b) Find the analytic function whose real part is $e^{-x}(x \sin y - y \cos y)$.

(c) Show that under the transformation $W = \frac{Z - i}{Z + i}$, real axis in the Z-plane is mapped into the circle $|W| = 1$. Which portion of the Z-plane corresponds to the interior of the circle ?

Or

6. (a) If $f(z)$ is an analytic function, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|Rf(z)|^2 = 2|f'(z)|^2$.

(b) If the potential function is $\log(x^2 + y^2)$, find the flux function and the complex potential function.

(c) Find the image of the circle $|z| = 3$ under the transformation $w = z + 4 + 3i$.

Module 4

7. (a) Evaluate $\Delta(\sin 2x \cos 4x)$. Assume the interval of differencing as h.

(b) Express $f(u) = u^4 - 3u^2 + 2u + 6$ in terms of factorial polynomials. Hence show that $\Delta^4 f(u) = 24$.

(c) If $u_0 = 1, u_1 = 0, u_2 = 5, u_3 = 22, u_4 = 57$, find the $u_{0.5}$ by Newton's formula.

Or

8. (a) Use Lagrange's interpolation formula and find the value at $x = 4.5$ with the following data :

x	:	1	3	5
y	:	1.5706	1.5712	1.5728

(b) Use Newton's divided difference formula to find $f(x)$ from the following data :

x	:	0	1	2	4	5	6
y	:	1	14	15	5	6	18

Module 5

9. (a) From the following table, calculate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.25$.

x	:	1.1	1.2	1.3	1.4	1.5	1.6
y	:	−1.6263	0.1558	2.4526	5.3917	9.1250	13.8307

(b) Estimate the length of the arc of the curve $3y = x^3$ from (0, 0) to (1, 3) using Simpson's $\frac{1}{3}$ rule taking 8 sub-intervals.

Or

10. (a) Apply (i) trapezoidal rule ; (ii) Simpson's $\frac{1}{3}$ rule, to find an approximate value of $\int_{-3}^{3} x^4\,dx$ by taking six equal sub-intervals. Compare them with the exact values.

(b) From the table below, for what values of x, y is minimum ? Also find this value of y.

x	:	3	4	5	6	7	8
y	:	0.205	0.240	0.266	0.260	0.251	0.222

(5 × 20 = 100 marks)