F 4725 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Naval Architecture and Ship Building/Aeronautical/Mechanical/ Production Engineering

AN 010 303
ME 010 303
PE 010 303/ST 010 303
} FLUID MECHANICS (AN, ME, PE, ST)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain why petrol evaporates more readily than water at ordinary temperature.
2. Explain hydraulic gradient line and total energy line.
3. Compare the advantages and disadvantages of orifice meter and venturimeter.
4. Distinguish between streamline, streakline and pathline.
5. Define the terms drag and lift.

(5 × 3 = 15 marks)

Part B

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

6. Discuss the conditions of equilibrium of floating bodies.
7. What are the limitations of Bernoulli's equation ?
8. What is Moody's chart ? What is its significance ?
9. What is Magnus effect ? Give examples.
10. What is a boundary layer ? How the boundary layer thickness is defined ?

(5 × 5 = 25 marks)

Turn over

Part C

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

11. (a) A circular plate of diameter 5 m. is immersed vertically in water so that its centre is at a depth of 6 m. below force surface of water. Find the total pressure on the plate and position of centre of pressure. Find expression for depth and center of pressure and total pressure.

Or

(b) Two large plane surfaces are 2.4 m. apart. The space between the surface is filled with glycerine. What force is required to drag a very thin plate of surface area 0.5 square metre between the two large plane surface at a speed of 0.6 m./sec., if (i) the thin plate is in the middle of the two plane surfaces and (ii) the thin plate is at a distance of 0.8 cm. from one of the plane surfaces. Take absolute viscosity of glycerine as 8.1×10^{-1} Pa. sec.

12. (a) Derive an expression for the discharge through a venturimeter.

Or

(b) Derive Euler's equation of motion along a streamline. Integrate it to obtain Bernoulli's equation for incompressible fluids.

13. (a) Show that the loss of head between two section in a circular pipe through which viscous fluid is flowing is given by $h_f = \frac{32\mu VL}{\rho g D^2}$.

Or

(b) Two reservoirs are connected by three pipes laid in parallel. The pipe diameters are 10 cm., 20 cm. and 30 cm. respectively and they are of same length. If discharge through 10 cm. pipe is 1 $m.^3$/sec., calculate the discharge through larger pipes. Assume the friction factor f to be same for the pipes.

14. (a) Derive the equation of continuity. Calculate the unknown velocity components so that they follow the continuity equation :

(i) $u = 2x^2, v = 2xyz, w = ?$

(ii) $u = 2x^2 + 2xy, w = z^3 - 4xz + 2yz, v = ?$

Or

(b) For a two-dimensional potential flow, the velocity potential is given by $\phi = x(2y - 1)$. Find the velocity at the point ϕ (4, 5). Find also the stream function ψ at the point P.

15. (a) For the velocity profile for laminar boundary layer $u/u = 2(y/\delta) - 2(y/\delta)^3 + (y/\delta)^4$. Obtain an expression for boundary layer thickness, shear stress, and drag force on one side of the plate and coefficient of drag in terms of Reynolds Number.

Or

(b) The wing of an aeroplane is designed to develop a lift of 5×10^4 N, if the span is 10.5 m. and the mean chord length 1.8 m., calculate the total drag at a speed of 500 km./hr. Assume elliptical lift distribution. Density of air is 1.207 kg./$m.^3$ and profile drag coefficient is 0.012.

(5 × 12 = 60 marks)

F 4736 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Automobile/Mechanical/Production Engineering

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

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Define and explain Allotropy.
2. What is co-ordination number ?
3. What do you mean by work hardening ?
4. What is the application of HSS ?
5. Define fracture toughness.

(5 × 3 = 15 marks)

Part B

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

6. Define and explain Schmid's law.
7. Briefly discuss crystal structure determination by X-ray diffraction.
8. What are the conditions for the formation of (i) bainite ; and (ii) spheroidite ?
9. How to improve corrosion resistance of steels ?
10. What do you mean by superplasticity ? Explain.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. Discuss the various modes of plastic deformation with examples and neat sketches.

Or

12. Explain the importance of Miller Indices. Discuss the concept of brittleness of BCC, HCP and ductility of FCC.

13. With neat sketches, explain any four crystal imperfections.

Or

14. Write notes on :

    (i) Homogeneous nuclei formation.

    (ii) Creep resistance.

    (iii) Dendritic growth.

(3 × 4 = 12 marks)

15. What are multi-phase equilibrium diagrams ? Explain any *two* of them.

Or

16. With neat sketches, explain (i) laser beam hardening ; and (ii) electron beam hardening.

17. Discuss the effect of alloying elements on displacement of the eutectoid point.

Or

18. Discuss the applications of the following alloys :

    (i) Magnesium ; (ii) Titanium ; (iii) Aluminium.

    What are their properties ?

19. Write notes on :

    (i) Inter-granular fracture.

    (ii) Impact loading.

    (iii) Thermal fatigue.

(3 × 4 = 12 marks)

Or

20. Explain the phenomena of ductile to brittle transition in steels. What are the structural changes in the grains due to this phenomena ?

[5 × 12 = 60 marks]

F 4748 3

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

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, MT]

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Write neat and efficient C Programs wherever required.

Part A

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

1. State the rules to construct identifiers in C.
2. With examples show how will you declare one-dimensional and two-dimensional arrays.
3. Explain any three string handling functions in C.
4. Explain the dynamic memory allocation with suitable examples.
5. Explain the use of bitwise operators.

(5 × 3 = 15 marks)

Part B

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

6. Explain all the logical operators in C, giving suitable examples.
7. Write a function to reverse a given word.
8. What is recursion ? Write a recursive function to find the nth power of x.
9. Explain call-by-reference with an example.
10. How files can be opened in C programs ? Give syntax for opening a file in read mode, write mode and append mode.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. Write the algorithm and the C program to find the area and volume of a cone. Use formatted I/O statements and explain.

Or

12. (a) How the data types are classified ? Explain with the help of examples. (6 marks)

(b) Explain the scanf () and printf () with their possible format fields for the above data types. (6 marks)

13. Write a C program using structures to accept the information of a C book such as its number, author, publisher and price and also display it.

Or

14. Write a C program to sort given N numbers in ascending order using bubble sort technique.

15. Write a C program to generate random numbers using functions, without using the rand () library function.

Or

16. (a) What is recursion ? Explain with an example. (4 marks)

(b) Write a function to accept 100 characters and to display whether each input character is a digit, or a lowercase alphabet or a uppercase alphabet or a special character. (8 marks)

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

Or

18. Write a C program to copy a string in reverse order to another string variable using pointers. For example, st = "AMAR" is to be copied as rst = "RAMA".

19. Write a C program that will take an input file of 1000 paybill records. Each record consists of Basic pay, DA, HRA, CCA, LIC and loan cuttings. Assume necessary field lengths and create three output files depending on the basic pay.

Or

20. A student master file consists of register number, name and marks in 8 subjects. Write a C program which will read the file and print a list of students who have failed in one or more subjects. Assume 50 % marks to pass each subject.

(5 × 12 = 60 marks)

F 4759 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

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—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are elastic constants ?
2. List the different types of loads commonly applied on beams.
3. What is the importance of MaCaulay's method ?
4. Discuss the significance of torsional rigidity.
5. Define Kern of a section.

(5 × 3 = 15 marks)

Part B

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

6. Write a note on equilibrium and compatibility conditions.
7. Discuss any one of the graphical methods for constructing shear force and bending moment diagrams.
8. Show that the resultant force for a rectangular section for half section above the neutral axis is $3M/2d$, where M is the bending moment at a cross-section and d is the depth of section. Also find the position of section where this resultant force passes.
9. Derive an expression for modulus of rupture in torsion.
10. Define slenderness ratio and discuss its importance.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. (a) A pressure vessel is made of a copper tube of mean diameter 12 cm. and 6.5 mm. thick. The two ends are closed by thick plates held together by two steel bolts 25 mm. diameter. The bolts are put in tension by a pull of 20 kN at 40° C. Calculate the stresses in tube and bolts at 10° C. At what temperature, the vessel does not remain pressure tight.

$E_s = 200$ GN/m.^{2}, $\alpha_s = 11 \times 10^{-6}$ K^{-1}

$E_c = 100$ GN/m.^{2}, $\alpha_c = 18 \times 10^{-6}$ K^{-1}

Or

(b) A rod having length l tapers uniformly from a diameter of d_1 to a diameter d_2. The rod is fixed vertically with larger diameter d_1 at the top. Find an expression for elongation of the rod under its own weight if it weighs 'W' per unit volume and has E as the modulus of elasticity.

12. (a) A beam of length 'l' carries a uniformly distributed load of W/unit length over whole of its span AC. The beam is supported at left end A and a point B such that BC is overhanging portion of the beam. Find the overhang in order that maximum bending moment (+ve or –ve) has minimum value. For this overhang, find reactions and maximum bending moment. Also, find the position of point of contraflexure.

Or

(b) A beam ABCD is 18 m. long with AB = 6 m., BC = 10 m. and CD = 2 m. The beam is simply supported at A and C and carries concentrated loads of 70 kN and 30 kN at B and D respectively along with total U.D.L. of 120 kN over AC. Draw bending moment and shear force diagrams.

13. (a) Shear force at a section of rectangular section beam is 144 kN. The beam section is 6 cm. wide × 12 cm. deep. Find the shear stresses at distances 0, 1, 2, 3, 4, 5 and 6 cm. measured from the neutral axis and hence plot the distribution of shear stress.

Or

(b) Find the deflection and slope at the free end of a cantilever beam of legnth 'L' with a concentrated load 'P' at a distance 'l' from the fixed end. What are the slope and the deflection under the load ? Take EI = constant.

14. (a) Find the internal and external diameters required for a hollow shaft which is to transmit 40 kW of power at 240 r.p.m., if the shear stress is to be limited to 100 MN/m^2. Take outside diameter to be twice the inside diameter.

Or

(b) The cylincer of a hydraulic ram has an internal diameter of 6 cm. Compute the thickness necessary to withstand an internal pressure of 40 N/mm^2, if maximum tensile stress is limited to 60 N/mm^2 and a maximum shear stress to 50 N/mm^2.

15. (a) A hollow alloy steel tube 5 m. long with external and internal diameters 40 mm. and 25 mm. was found to extend 6.4 mm. under a tensile load of 60 kN. Find buckling load for the tube when used as column with both ends pinned.

Or

(b) A T-section with flange 150 mm. × 20 mm. and stem 100 mm. × 20 mm., making 150 mm. × 120 mm. × 20 mm. T section, is used as a strut 4 m. long with hinged ends. Calculate the critical load for the strut by using Euler's formula.

E = 200 GPa.

(5 × 12 = 60 marks)

F 4779 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Mechanical Engineering

FLUID MECHANICS (M)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are non-Newtonian fluids ?
2. Define buoyancy.
3. Differentiate between pathline and streakline.
4. Write a note on irrotational flow.
5. What is Bernoulli's theorem ?
6. Differentiate between Mouth piece and Orifices.
7. List the features of an aerofoil.
8. What is a diffuser ?
9. Write a short note on hydraulic radius.
10. List the practical applications of water hammer.

(10 × 4 = 40 marks)

Part B

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

11. A stone weighs 392.4 N in air and 196.2 N in water. Compute the volume of stone and its specific gravity.

Or

12. Discuss the aspects of stability of floating and submerged bodies.

Turn over

13. A cylindrical vessel 12 cm. in diameter and 30 cm. deep is filled with water upto the top. The vessel is open at the top. Find the quantity of liquid left in the vessel, when it is rotated about its vertical axis with a speed of (a) 3000 r.p.m., and (b) 600 r.p.m.

Or

14. What is vortex flow ? Derive an equation of motion for free vortex flow.

15. Discuss the following with neat diagrams and sketches :

    (i) Magnus effect.

    (ii) Joukowski theorem.

Or

16. Explain the aspects of flow past a circular cylinder (cylinder with a circulation). Evaluate the pressure distribution at various regions of the cylinder.

17. Derive an expression for flow through orifices. Deduce an expression for discharge.

Or

18. Explain the working of an aerofoil. Derive expressions for (i) lift force ; and (ii) drag force on an aerofoil.

19. Find the displacement thickness the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by :

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2.$$

Or

20. How will you determine "equivalent pipe" ? Explain laminar flow and turbulent flow in pipes. Discuss in detail.

(5 × 12 = 60 marks)

F 4796 3

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Mechanical Engineering/Automobile Engineering

THERMODYNAMICS (M, U)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours

Maximum : 100 Marks

Part A

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

1. Differentiate between state and process.
2. Briefly explain continuum concept.
3. Why is temperature scale important ?
4. Define enthalpy of a system.
5. Discuss the concept of entropy.
6. What is unavailable energy ?
7. What is the significance of Helmholtz function ?
8. Write the equations for internal energy of a system.
9. What is the behaviuor of a mixture of gases and vapours ?
10. Define and explain Psychrometry.

(10 × 4 = 40 marks)

Part B

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

11. Explain macroscopic and microscopic analysis in thermodynamics. Give any *four* practical applications.

Or

12. Derive the real gas relations from fundamentals. Explain the law of corresponding states.

Turn over

13. What are the laws of thermodynamics ? Discuss Zeroth law of thermodynamics. Explain the concept of temperature.

Or

14. A mass of 1.5 kg. of air is compressed in a quasi-static process from 0.1 MPa to 0.7 MPa for which PV = constant. The initial density of air is 1.16 kg./m^3. Find the work done by the piston to compress the air.

15. A cyclic heat engine operates between a source temperature of 800° C. and a sink temperature of 30° C. What is the least rate of heat rejection per kW net output of the engine ?

Or

16. With neat sketches, explain the carnot cycle and carnot heat engine assuming ideal conditions. Explain the steady flow system.

17. Prove that the internal energy and enthalpy of an ideal gas are functions of temperature only.

Or

18. Calculate the latent heat of vaporization of steam formed by boiling water under a pressure of 101.325 Kpa. At a pressure near this, a rise of temperature of 1 K causes an increase of vapour pressure of 3.62 kPA.

19. "In a diffusion process, at constant temperature, the entropy increases and the Gibbs function decreases." Prove and explain in detail.

Or

20. A gaseous mixture consists of 1 kg. of oxygen and 2 kg. of nitrogen at a pressure of 150 kPa and a temperature of 20° C. Determine the changes in internal energy, enthalpy and entropy of the mixture when the mixture is heated to a temperature of 100° C. (a) at constant volume; (b) at constant pressure.

(5 × 12 = 60 marks)

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F 4804 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Mechanical Engineering/Polymer Engineering/Automobile Engineering

STRENGTH OF MATERIALS AND STRUCTURAL ENGINEERING (M, P, U)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Assume missing data if any, suitably.

Part A

Answer **all** *questions.*

Each question carries 4 *marks.*

1. Describe an expression for temperature stress.
2. How will you evaluate stresses in bars of varying cross-sections ?
3. Sketch and explain a overhanging beam.
4. Discuss theory of simple bending.
5. What is double integration technique ?
6. Discuss the concept of 'slope' and 'deflection'.
7. Write a note on power transmitted by hollow shafts.
8. Distinguish between thin cylinders and thick cylinders.
9. Write the practical applications of struts.
10. Briefly discuss columns and footings.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. Draw Mohr's stress circle for direct stresses 45 N/mm.^{2} (tensile) and 25 N/mm.^{2} (compressive), and find the magnitude and direction of resultant stresses on planes making angles of 30° and 60° with the plane of first principal stress. Also find the normal and tangential stresses on these planes.

Or

Turn over

12. (a) Derive expressions for temperature stresses in compound bars.

    (b) A steel bar 12 m. long and of diameter 5 cm. is turned over 5 m. of its length to diameter of 2.5 cm. If an axial load of 80 kN is applied, find the extension of the bar. E = 200 GN/m^2.

13. Determine the maximum flexure stress in the band saw blade 1 mm. thick if it is run over a pulley of 1 m. diameter, Take E = 200 GN/m^2.

Or

14. Prove that for all values of D/d of a hollow cylinder section of outer diameter, 'D' and inner diameter 'd', the ratio of maximum to average shear stress intensities lies between 4/3 to 2.

15. Find the maximum deflection for a 6 m. long beam simply supported at ends carrying a uniformly varying load from zero at ends to 10 kN per m. length at the centre. Take EI = 6 MN-m^2.

Or

16. A beam of 3 m. length is simply supported at ends. It carries uniformly distributed load of 4 kN/m. over whole of its length in addition to negative bending couples of 2 kN/m. at each end. Taking EI = 6×10^6 Nm^2, find the midspan deflection.

17. A hollow shaft has its external diameter twice the internal diameter. If it transmits a torque of 30 kN/m., find the outside and inside diameters of the shaft, if the allowable maximum shear stress is 60 MN/m^2. What is the shear stress at the inside of the shaft ?

Or

18. A thin walled cylinder 30 cm. internal radius and 31.5 cm. external radius is closed by rigid plates at ends. If the length of the cylinder is 2.4 m. and internal pressure is 4 MPa, find the change in internal volume taking E = 200 GPa and υ = 0.3.

19. Derive the Secant formula for columns fixed at one end and free at the other end. Discuss the analysis of eccentric loading.

Or

20. Explain Rankine's theory. Derive the Rankine Gordon formula from fundamentals.

(5 × 12 = 60 marks)