19. Using Buckingham's π-theorem and using the variables such as power 'P', speed 'N', head 'H', diameter 'D' of the turbine, density 'ρ' of the fluid and acceleration due to gravity 'g' deduce the expression for specific speed 'N's of the turbine.

$$N_s = \frac{N\sqrt{P}}{H^{5/4}}.$$

Or

20. (a) What is meant by geometric, dynamic and Kinematic similarity ? (3 marks)

(b) Inorder to predict the pressure drop in a large air duct a model is constructed with linear dimension $\left(\frac{1}{10}\right)^{th}$ that of the prototypes and that water was used as the testing fluid. If water is 1000 times denser than air and has viscosity 100 time that of the air, determine the pressure drop in the prototype, for the conditions corresponding to a pressure drop of 70 kPa in the model.

(9 marks)

[5 × 12 = 60 marks]

F 6883 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Third Semester

Branch : Civil Engineering

CE 010 303—FLUID MECHANICS [CE]

(New Scheme—2010 Admission onwards)

[Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. What do you mean by Newtonian and non-newtonian fluids ? Give examples.
2. Define circulation and vorticity.
3. What are hydraulic co-efficients ?
4. Define life and drag.
5. What do you understand by model and prototype ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Explain the relationship between absolutes gage and vacuum pressures.
7. When 2500 litres of water flows per minute through a 0.3 m. diameter pipe which later reduces to a 0.15 m. diameter pipe, calculate the velocities of flow in the two pipes.
8. Define a notch. Explain the classification of notches.
9. Explain Reynold's experiment.
10. What do you mean by a distorted model ? What are its merits and limitations ?

(5 × 5 = 25 marks)

Turn over

Part C

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

11. (a) A cylinder 0.1 m. diameter rotates in an annular sleeve 0.102 m. internal diameter at 100 r.p.m. The cylinder is 20 cm. long. If the dynamic viscosity of the lubricant between the two cylinders is 1.0 poise, find the torque needed to drive the cylinder against viscous resistance. Assume that Newton's law of viscosity is applicable and the velocity profile is linear.

(8 marks)

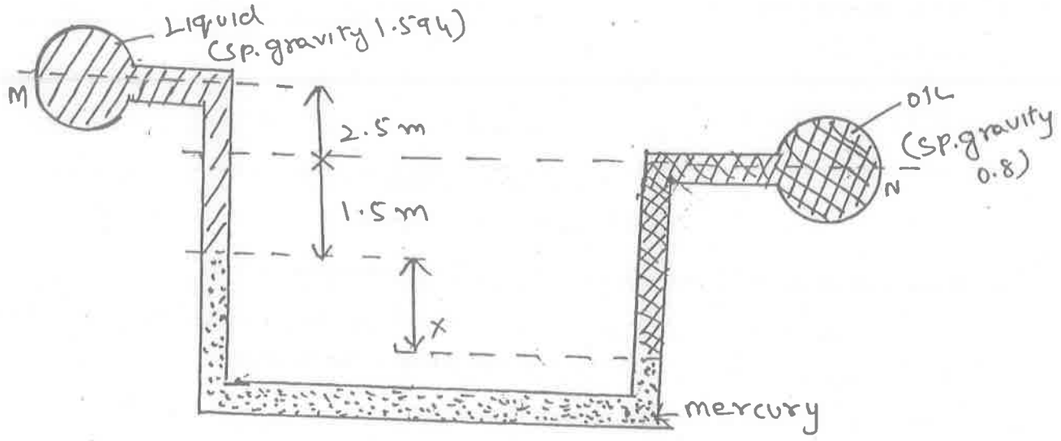
(b) Determine the mass density, weight density and specific volume of a liquid whose specific gravity is 0.85.

(4 marks)

Or

12. (a) Explain the pressure measurement using U-tube differential manometer. (5 marks)

(b) Pipe M contains a liquid of specific gravity 1.594 under a pressure of 10.5 N/cm^2. and pipe N contains an oil of specific gravity 0.8. If the pressure in the pipe N is 17.5 N/cm^2. and the manometric fluid is mercury, find the difference 'X' between the levels of mercury.



(7 marks)

13. The stream function for a two dimensional flow 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 $\psi = 300$ and equipotential lines corresponding to $\phi = 100$ and $\phi = 300$.

Or

14. A wooden cylinder of circular section and uniform density (diameter-'*d*' and length-'*l*') having specific gravity 0.6 is required to float in oil of specific gravity 0.8. Obtain the length to diameter ratio of the cylinder for stable equilibrium.

15. (a) Applying the Bernoulli's equation drive the expression for discharge of a liquid through an orifice meter.

(8 marks)

(b) Compare coefficient of discharge for an orifice meter and a venturimeter. Which will be greater and why is it so ?

(4 marks)

Or

16. A tank of constant cross-sectional area of 2.8 m^2. has two orifices each of 9.3 cm^2. is area in one of its vertical sides at heights of 6 m. and 1.5 m. respectively above the bottom of the tank. Calculate the time taken to lower the water level from 9 m. to 3.6 m. above the bottom of the tank. Assume $C_d = 0.625$

17. (a) Derive the Darcy-Weisbach equation for head loss in pipes due to friction. (9 marks)

(b) A piping system involves two pipes of different diameters (but of identical length, material and roughness) connected in parallel. How would you compare the flow rates and pressure drops in these two pipes ?

(3 marks)

Or

18. The main pipe is divided into two parallel pipes which again forms one pipe. The first parallel pipe has length of 1000 m. and diameter of 80 cm. The second parallel pipe has length of 1000 m. and diameter of 60 cm. The coefficient of friction for each parallel pipe is 0.005. If the total flow rate in the main pipe is 2 m^3/s, find the flow rate in each parallel pipe.

F 6893 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Third Semester

Branch : Civil Engineering

CE 010 304—MECHANICS OF SOLIDS—I [CE]

[New Scheme—2010 Admission onwards]

(Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What do you mean by thermal stresses ?
2. With the help of neat sketch, explain the types of beams.
3. Explain the concept of beams of uniform strength.
4. Explain the term 'shear flow' of beams in solid mechanics.
5. What are the limitations of Euler's formula for column ?

(5 × 3 = 15 marks)

Part B

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

6. Define elastic constants. Derive the relation between modulus of elasticity and modulus of rigidity.
7. A cantilever beam 6 m long carrying a uniformly distributed load of 24 kN/m is spread over a length 3 m from free end. It carries a point load of 30 kN at the free end. Draw the shear force diagram and bending moment diagrams.
8. Derive the expression for theory of pure bending of beams.
9. Obtain a relation for the torque and power, a solid shaft can transmit.
10. "Rankines's theory is applicable for all cases ranging from struck to long column". Elucidate statement.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. A steel tube 50 mm in external diameter and 3 mm thick enclosed centrally a solid copper bar of 35 mm diameter. The bar and tube are rigidly connected together at the ends at a temperature of 20° C. Find the stresses in each metal when heated to 180° C. Also find the increase in length, if the original length of the assembly is 350 mm. Coefficients of expansion for steel and copper are 1.08×10^5/°C and 1.7×10^{-5}/°C respectively. Take $E_s = 2 \times 10^5 N/mm^2$ and $E_c = 1 \times 10^5$ N/mm².

Or

12. Two planes AB and BC which are at right angles to each other carry shear stresses of intensity 18 N/mm² while these planes are also carry a tensile stress of 70 N/mm² and a compressive stress of 40 N/mm² respectively. Draw the Mohr's circle and determine the principal planes and principal stresses.

    Verify the answers using analytical method.

13. A horizontal beam 10 m long carries a uniformly distributed load of 180 N/m and in addition a concentrated load of 200 N at the left end. The beam over hangs on either side and the supports are 7 metre apart, so choosen that each support carries half the total load. Determine the length of over hangs. Draw the shear force and bending moment diagrams.

Or

14. A ladder 6 m long weighining 300 N/m run, rests against a smooth vertical wall with bottom resting on the rough ground, the vertical distance between the end of the ladder being 4 m. A man weighining 650 N is standing on the ladder at 2m from the bottom and another man weighining 600 N on the ladder at 4 m from the bottom. Construct the shear force and bending moment diagrams for the ladder.

15. A simply supported beam of span 6 m carries uniformly distributed load of 12 kN/m over the entire span and a point load of 9 kN at 3 m from left support. If the bending stress in beam is not to exceed 8 N/mm², design the suitable section of the beam, if depth of beam equals twice the breadth.

Or

16. An I section beam 400 mm thick and 200 mm wide has a web thickness 50 mm and flange thickness 50 mm. It carries a shearing force of 400 kN at a section. Sketch the shear stress distribution across the beam section.

17. The diameter ratio of a hollow shaft is 0.6. It required to transmit 600 kW at 200 r.p.m. Determine the diameter, if the allowable stress in the material is 100 N/mm² and the angle of twist over 3 m length is not to exceed 1.5°. Take modulus of rigidity 78 kN/mm² and Poisson's ratio 0.3.

Or

18. A hollow shaft is of 70 mm internal diameter and diameter ratio is 0.5. If the maximum shear stress in the shaft limited to 110 MPa and allowable twist 1° per metre length, find the maximum power that can be transmitted to the shaft, if it is rotate at 100 r.p.m. Take $G = 8 \times 10^4$ MPa.

19. A circular column has length 2 metre and diameter 70 mm. The column is fixed in direction and position at one end and to free at other end. Calculate safe load using Rankine's formula and Euler's formula taking a factor of safety as 4. Take E = 80 kN/mm², Yield stress $\sigma_c = 550$ N/mm² and Rankines constant $\alpha = \frac{1}{1600}$.

Or

20. A short cast iron column of hollow circular section has a projecting bracket carrying a load of 50 kN. The load line is off the axis of the column by 300 mm. The external diameter of the column is 300 mm and the thickness of the metal is 25 mm. Find the maximum and minimum stress intensities in the section.

(5 × 12 = 60 marks)

F 6905 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Third Semester

Branch : Civil Engineering

CE 010 305—SURVEYING—I [CE]

(New Scheme—2010 Admission onwards)

[Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. Define latitude and departure.
2. Explain reciprocal levelling.
3. Write short note on Gales traverse table.
4. Explain mass haul curve.
5. State the elements of simple curve.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Computer the angle between the lines XY and XZ, if their respective bearings are,
   (a) 30° 30′ and 55° 15′.
   (b) 25° 15′ and 135° 15′.
   (c) 45° 00′ and 120° 00′.
7. Calculate the combined correction for curvature and in a distance :
   (a) 100m,
   (b) 750m and
   (c) 3km.

Turn over

8. State and explain distance and elevation formulae for staff held vertical in tacheometric surveying.

9. State and explain Simpsons rule for area calculation.

10. Calculate the ordinates at 3 m distance for a circular curve having a long chord of 40 m and versed sine of 2 m.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. State and explain two point problem and its solutions and application.

Or

12. The following fore bearings and back bearings were observed in traversing with a compass, well local attraction was suspected :

Line	FB	BB
AB	60° 30'	245° 30'
CD	43° 45'	226° 30'
BC	104° 15'	283° 00'
DE	326° 15'	144° 45'

Determine the corrected bearings of the lines.

13. Explain instruments used for levelling. Discuss the temporary and permanent adjustment in levelling works.

Or

14. The following consecutive readings curve taken with a level and 5m levelling staff on continuousely sloping at a common interval of 20 meters : 0.385 ; 1.030 ; 1.925 ; 2.825 ; 3.730 ; 4.685 ; 0.625 ; 2.005 ; 3.110 ; 4.485. The RL of the first point was 208.125 m. Rule out a page of a level field book and enter the above readings. Calculate the reduced levels of the points by rise and fall method and also the gradient of the joining the first and the last point.

15. Explain the working and classification of theodolite. State the fundamental lines of theodolite. Discuss the applications of theodolite.

Or

16. The staff was held vertically upon the point and the instrument is fitted within an anallactic lens, the constant of the instrument being 100. Compute the elevation of the point P from the following data : elevation of a point P is to be determined by observations from two adjacent stations of a techeometric survey. The taking both the observation as equally trust worthy :

Instrument Station	Nt of axis	Staff point	Vertical Angle	Staff Readings	Elevation of station
A	1.42	P	+ 2° 24'	1.23, 2.055, 2.88	77.75
B	1.40	P	– 3° 36'	0.785, 1.8, 2.815	97. 135

17. Define transition curve. Discuss different units for measuring volume. Discuss the procedure for measuring capacity of a reservoir by contour method.

Or

18. The following perpendicular offsets were taken from a chain line to an irregular boundary.

Chainage	0	10	25	42	60	75 m
Offset	15. 5	26.2	31.8	25.6	29	31.5

Calculate the area between the chain line, the boundary and the end offsets.

19. Define transition curves. Discuss different kinds of transition curve. Explain the functions and requirements of transition curves.

Or

20. Explain setting out curves by offsets from tangents and ordinates from long cord.

(5 × 12 = 60 marks)