L-2/T-2/WRE **Date : 15/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **CE 223** (Mechanics of Solids II)

Full Marks: 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) An element of a brittle material (ultimate tensile strength, $\sigma_{u(T)}$ = 45 ksi and ultimate compressive strength, $\sigma_{u(C)}$ = 35 ksi) is subjected to the state of stress as shown in Figure 1. Check whether crushing will occur or not on the basis of Rankine principal stress theory. **(5)**

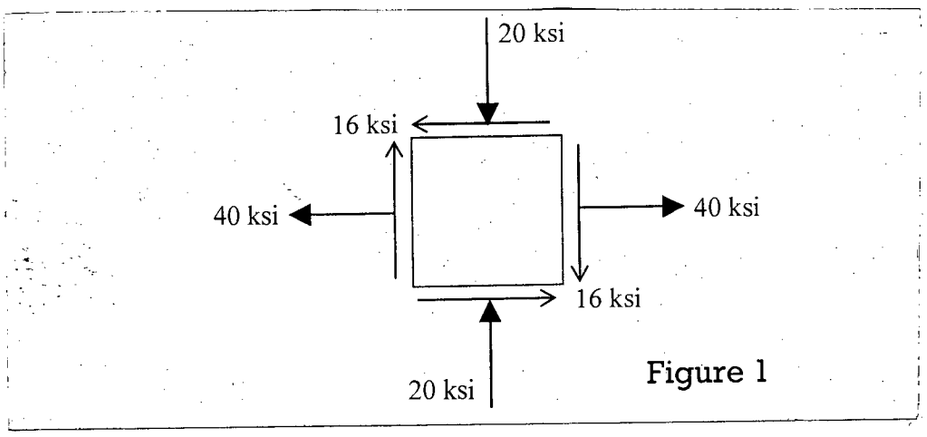


Figure 1

(b) A bolt subjected to axial and transverse load of 12 kN and 7 kN respectively as shown in Figure 2. Determine the diameter of bolt needed considering Tresca maximum shear stress criterion and Von-Mises distortion energy criterion. Given, yield stress of under uni-axial tension (σ_{yp}) = 140 MPa. **(10)**

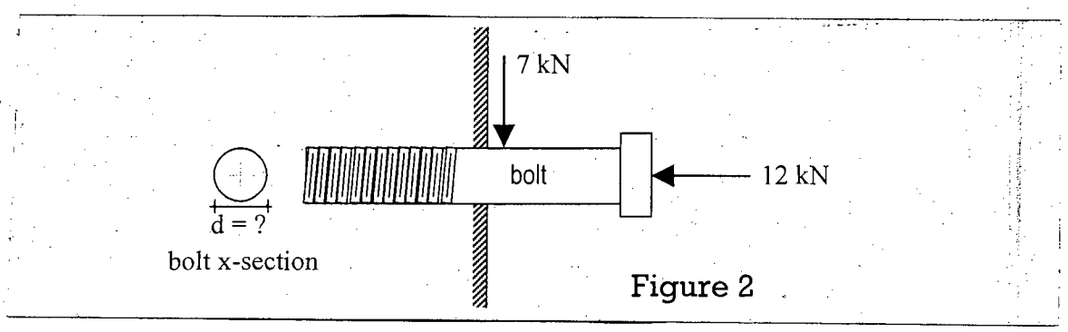


Figure 2

(c) A $\frac{3}{4}$ inch thick bracket plate is fastened to a $\frac{7}{8}$ inch thick main plate as shown in Figure 3. Determine the required size of rivets. Rivet sizes available are from $\frac{1}{2}$ inch to $1\frac{1}{4}$ inch with $\frac{1}{8}$ inch increments. Given, allowable shear stress of rivet = 15 ksi, allowable bearing stress between rivet and plate = 30 ksi. **(20)**

Contd P/2

CE 223

Contd... Q. No. 1(c)

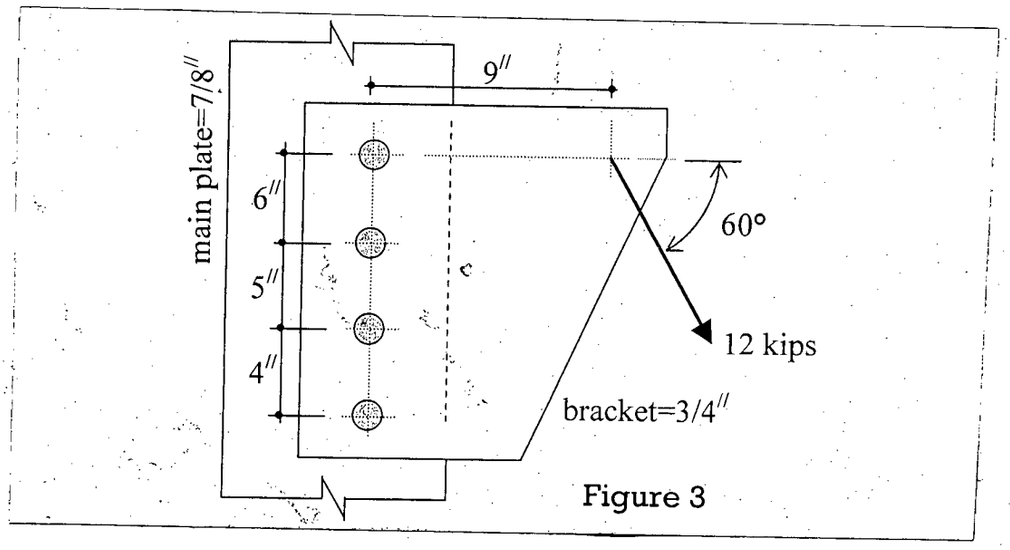


Figure 3

2. (a) A flexible cable whose ends are supported at different elevation, subjected to concentrated loads as shown in Figure 4. Determine (i) horizontal component of cable tension (H), (ii) maximum and minimum cable tension, $T_{maximum}$ and $T_{minimum}$, (iii) cross-sectional area of the cable (A) and (iii) stretched length (S) and elongation (ΔS) of the cable. **(25)**

Given, allowable tensile stress ($\sigma_{allowable}$) = 30 ksi and modulus of elasticity (E) of cable material = 30000 ksi.

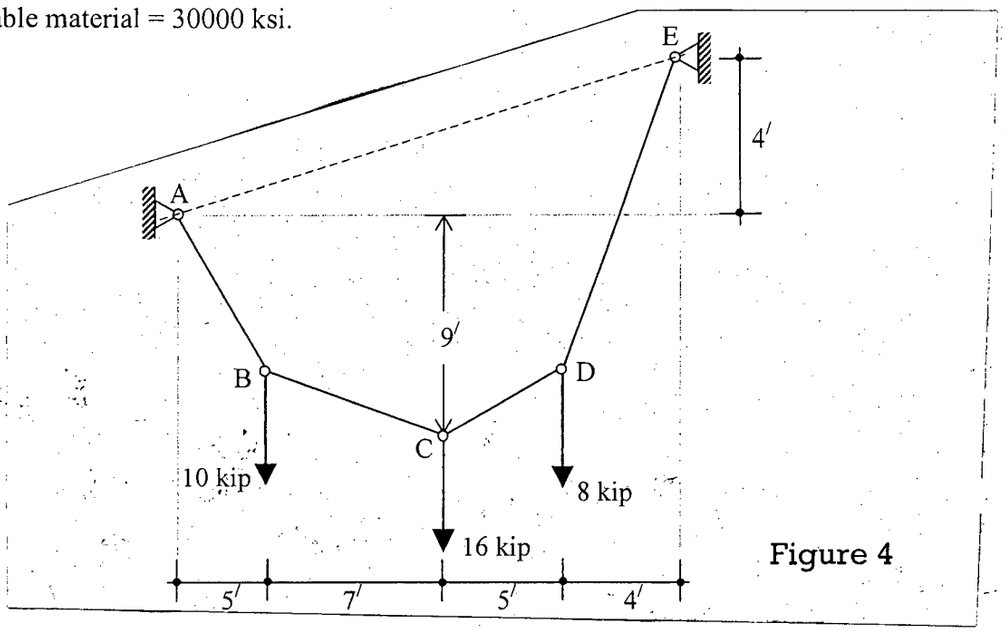


Figure 4

(b) Determine strain energy absorbed by the loaded simple beam as shown in Figure 5. Also, compute the rotation of point 'B'. Given, bending stiffness (EI) = 60,000 kip-feet^2. **(10)**

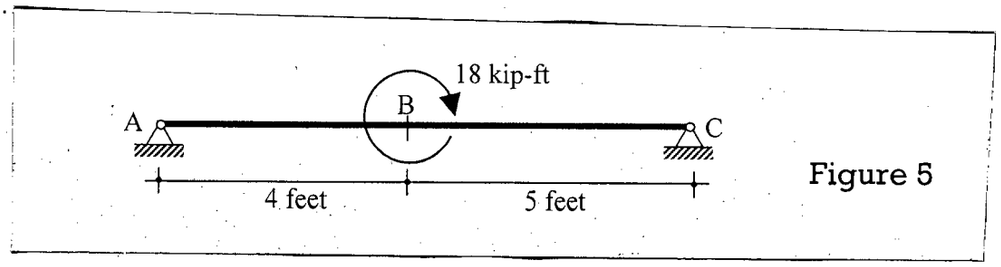


Figure 5

Contd P/3

CE 223

3. (a) A cylindrical pressure vessel with internal diameter of 30 inch is subjected an internal pressure of 600 psi as shown in Figure 6. What will be it's wall thickness if total strain energy theory of failure is considered. Given, yield stress under uni-axial tension (σ_{yp}) = 40 ksi, Poisson's ration (μ) = 0.30 and modulus of elasticity (E) = 30000 ksi. **(10)**

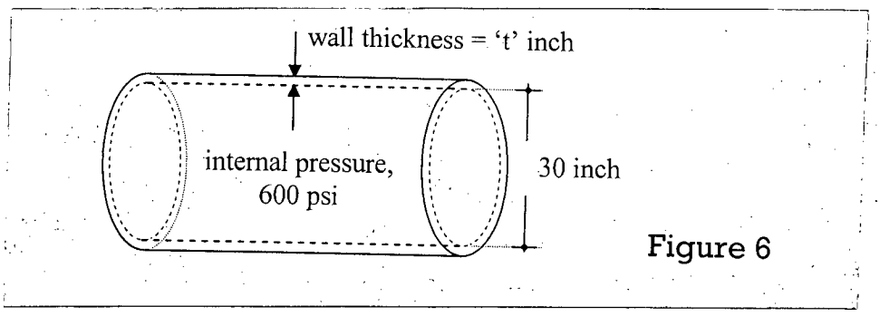


Figure 6

(b) Determine the fillet weld size (s) required to support the external loads acting at free end of a bracket which is connected to steel column as shown in Figure 7. Use E70 electrode. Weld sizes are available with $\frac{1}{16}$ inch increments. **(25)**

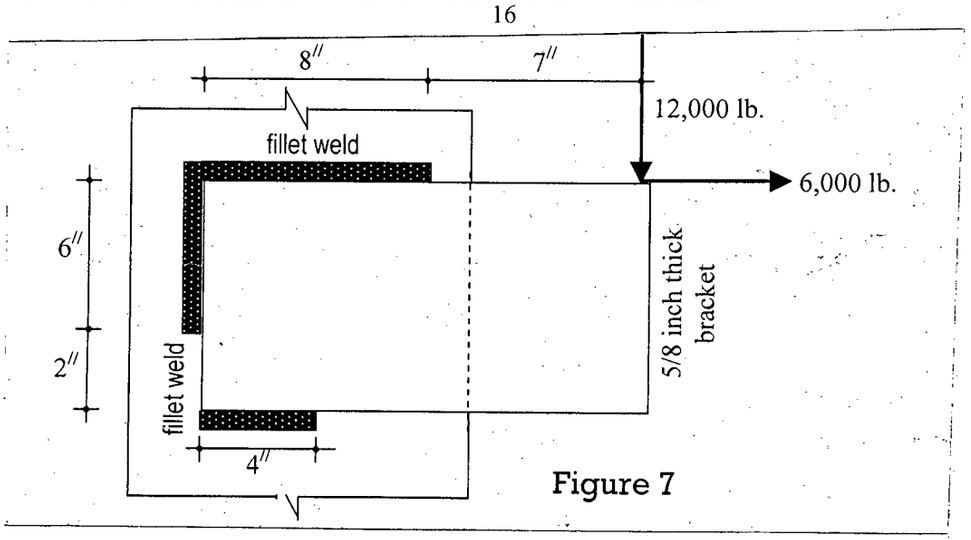


Figure 7

4. (a) A fixed ended steel column (proportion limit = 40 ksi and modulus of elasticity = 29000 ksi) as shown in Figure 8 needs to support an axial compressive load of 300 kip. Determine diameter of the column considering it as a long column. **(10)**

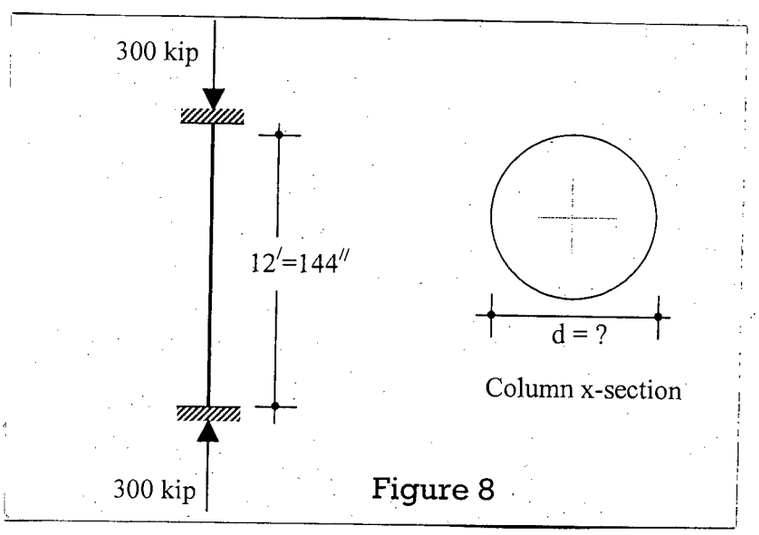


Figure 8

Contd P/4

CE 223

Contd... Q. No. 4

(b) Using direct integration method, determine the equation of rotation and deflection for the indeterminate beam as shown in Figure 9. Also, compute the reaction at left support 'A', rotation at 'D' and deflection at 'E'. Given, bending stiffness (EI) = 45,000 kip-feet^2. **(25)**

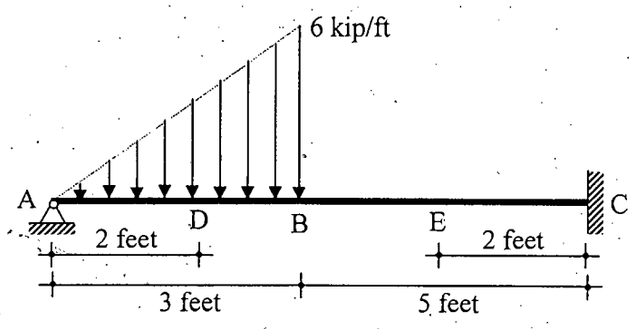


Figure 9

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

Assume reasonable values for missing data.

5. (a) Find the deflection and rotation of the free end A and point C of the beam shown in Figure 10 caused by the applied forces. The beam's constant flexural rigidity EI = 60 N.m^2. **(20)**

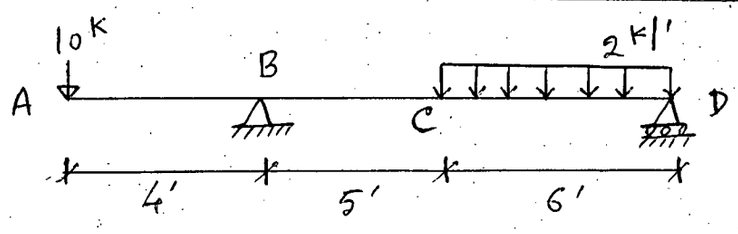


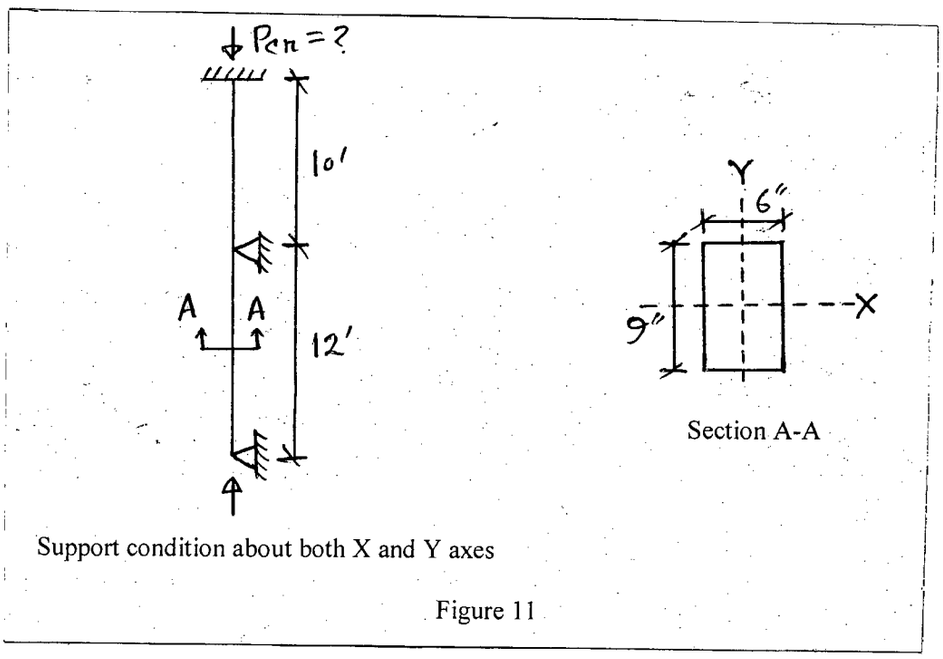
Figure 10

(b) Find the critical load, P_{cr} for a steel column having a cross-sectional area of 6"×9", for which the elastic Euler formula applies. The end conditions of the column are shown in the Figure 11. Let E = 200 GPa. **(15)**

Contd P/5

CE 223

Contd... Q. No. 5(b)



Support condition about both X and Y axes

Figure 11

6. (a) Prove that kern of a circular section is located at r/4 from the center, where r is the radius of the section. **(5)**

(b) A vertical 4.80-kN load is applied on a wooden post of rectangular cross-section, 80 by 120 mm as shown in Figure 12. Determine the stress at point A, B, C and D and locate the neutral axis of the cross-section. **(15)**

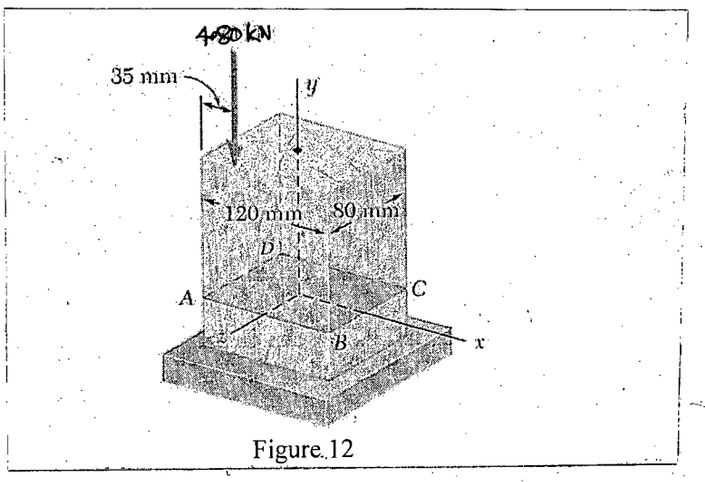


Figure.12

(c) Draw state of stress of element 'A' and using stress transformation formula determine normal and shear stress at a plane inclined at 45^0 with the vertical axis as shown in Figure 13. Given, E = 30,000 ksi. **(15)**

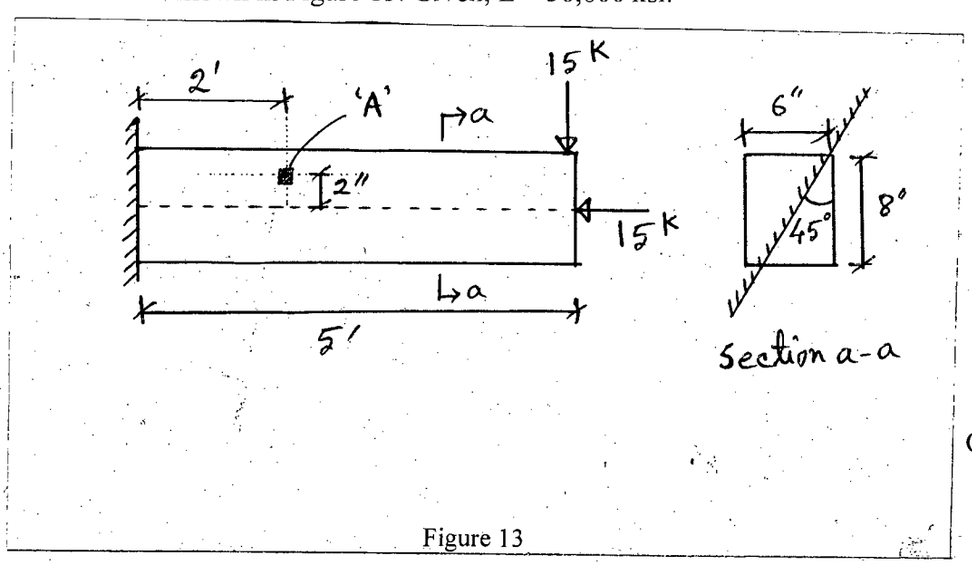


Figure 13

Contd P/6

CE 223

7. (a) For the state of stress shown in Figure 14, determine (i) the principal planes, (ii) the principal stresses (iii) the maximum shearing stress and the corresponding normal stress. Draw Mohr's circle in a plain graph paper and show the results on properly oriented elements. **(15)**

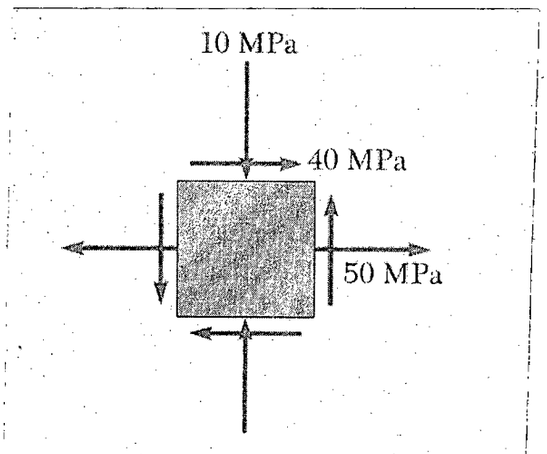


Figure 14

(b) Using AISC ASD column formulas, select the lightest section of a 15 ft long pin ended column to carry a concentric load of 220 kips. The structural steel is to be A 572, having σ_{yp} = 50 ksi. American standard steel W shapes dimensions and properties are attached in Annexure-1 and the formulas are given below: **(20)**

$$for\ \frac{kL}{r} > C_c,\ \sigma_{allow} = \frac{12\pi^2 E}{23\left(\frac{kL}{r}\right)^2}$$

$$for\ \frac{kL}{r} < C_c,\ \sigma_{allow} = \frac{\left[1-\left(\frac{kL}{r}\right)^2 / 2C_c^{\,2}\right]\sigma_{yp}}{F.S.}$$

$$\text{Where, F.S.} = \frac{5}{3}+\frac{3(kL/r)}{8C_c}-\frac{(kL/r)^3}{8C_c^{\,3}}.$$

8. (a) The lap joint shown in Figure 15, is fastened by nine ¾" diameter bolts. Calculate the maximum safe load P that can be applied in the connection. Given- **(20)**

allowable shearing stress in bolts	= 15 ksi
allowable bearing stress	= 18 ksi
allowable bearing stress of plates	= 22 ksi

Contd P/7

CE 223

Contd... Q. No. 8(a)

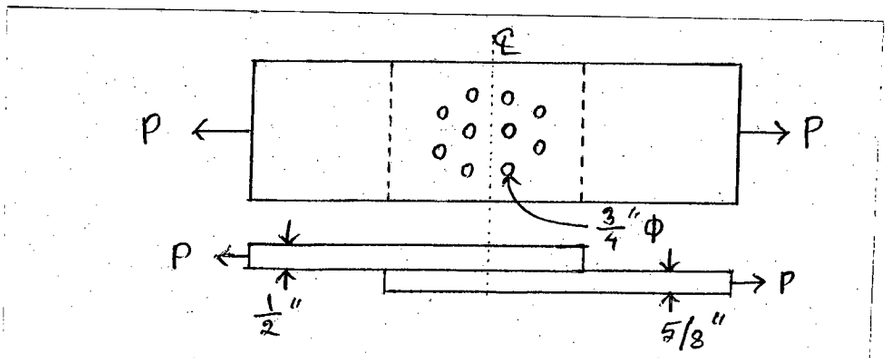


Figure 15

(b) The rectangular cross section shown in Figure 16 is subjected to a bending moment of M = 12 kN.m. Determine the normal stress developed at each corner of the section, and specify the orientation of the neutral axis. **(15)**

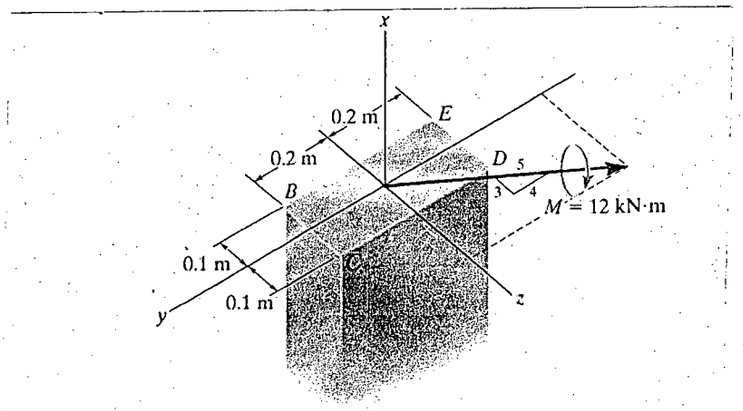


Figure 16

Annexure-I

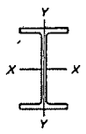


Table 4. American Wide-Flange Steel Beams, W Shapes, Properties for Designing

Designation*	Area	Depth	Flange		Web	Axis X–X			Axis Y—Y		
			Width	Thickness	Thickness	I	$S = I/c$	r	I	$S = I/c$	r
	in^2	in	in	in	in	in^4	in^3	in	in^4	in^3	in
W36 × 230	67.6	35.90	16.470	1.260	0.760	15000	837	14.9	940	114	3.73
× 150	44.2	35.85	11.975	0.940	0.625	9040	504	14.3	270	45.1	2.47
W33 × 201	59.1	33.68	15.745	1.150	0.715	11500	684	14.0	749	95.2	3.56
× 130	38.3	33.10	11.510	0.855	0.580	6710	406	13.2	218	37.9	2.38
W30 × 173	50.8	30.44	14.985	1.065	0.655	8200	539	12.7	598	79.8	3.43
× 108	31.8	29.82	10.484	0.760	0.548	4470	300	11.9	146	27.9	2.15
W27 × 146	42.9	27.78	13.965	0.975	0.605	5630	411	11.4	443	63.5	3.21
× 94	27.7	26.92	9.990	0.745	0.490	3270	243	10.9	124	24.8	2.12
W24 × 131	38.5	24.48	12.855	0.960	0.605	4020	329	10.2	340	53.0	2.97
× 76	22.4	23.92	8.990	0.680	0.440	2100	176	9.69	82.5	18.4	1.92
W21 × 111	32.7	21.51	12.340	0.875	0.550	2670	249	9.05	274	44.5	2.90
× 62	18.3	20.99	8.240	0.615	0.400	1330	127	8.54	57.5	13.9	1.77
W18 × 97	28.5	18.59	11.145	0.870	0.535	750	188	7.82	201	36.1	2.65
× 50	14.7	17.99	7.495	0.570	0.355	800	88.9	7.38	40.1	10.7	1.65
× 35	10.3	17.70	6.000	0.425	0.300	510	57.6	7.04	15.3	5.12	1.22
W16 × 100	29.4	16.97	11.425	0.985	0.585	1490	175	7.10	186	35.7	2.51
× 50	14.7	16.25	7.070	0.630	0.380	659	81.0	6.68	37.2	10.5	1.59
× 36	10.6	15.86	6.985	0.430	0.295	448	56.5	6.51	24.5	7.00	1.52
× 26	7.68	15.69	5.500	0.345	0.250	301	38.4	6.26	9.59	3.49	1.12
W14 × 730	215.0	22.42	17.890	4.910	3.070	14300	1280	8.17	4720	527	4.69
× 455	134.0	19.02	16.835	3.210	2.015	7190	756	7.33	2560	304	4.38
× 311	91.4	17.12	16.230	2.260	1.410	4330	506	6.88	1610	199	4.20
× 193	56.8	15.48	15.710	1.440	0.890	2400	310	6.50	931	119	4.05
× 159	46.7	14.98	15.565	1.190	0.745	1900	254	6.38	748	96.2	4.00
× 90	26.5	14.02	14.520	0.710	0.440	999	143	6.14	362	49.0	3.70
W14 × 74	21.8	14.17	10.070	0.785	0.450	796	112	6.04	134	26.6	2.48
× 68	20.0	14.04	10.035	0.720	0.415	723	103	6.01	121	24.2	2.46
× 61	17.9	13.89	9.995	0.645	0.375	640	92.2	5.98	107	21.5	2.45
× 53	15.6	13.92	8.060	0.658	0.370	542	77.8	5.90	57.5	14.3	1.92
× 43	12.6	13.66	7.995	0.530	0.305	428	62.7	5.82	45.2	11.3	1.89
W14 × 38	11.2	14.10	6.770	0.515	0.310	385	54.6	5.87	26.7	7.86	1.54
× 34	10.0	13.98	6.745	0.455	0.285	340	48.6	5.83	23.3	6.91	1.53
× 30	8.85	13.84	6.730	0.385	0.270	291	42.0	5.73	19.6	5.82	1.49
W12 × 87	25.6	12.53	12.125	0.810	0.515	740	118	5.38	241	3.97	3.07
× 65	19.1	12.12	12.000	0.605	0.390	533	87.9	5.28	174	29.1	3.02
× 53	15.6	12.06	9.995	0.575	0.345	425	70.6	5.23	95.8	19.2	2.48
× 40	11.8	11.94	8.005	0.515	0.295	310	51.9	5.13	44.1	11.0	1.93
W12 × 35	10.3	12.50	6.560	0.520	0.300	285	45.6	5.25	24.5	7.47	1.54
× 30	8.79	12.34	6.520	0.440	0.260	238	38.6	5.21	20.3	6.24	1.52
× 26	7.65	12.22	6.490	0.380	0.230	204	33.4	5.17	17.3	5.34	1.51
W10 × 112	32.9	11.36	10.415	1.250	0.755	716	126	4.66	238	45.3	2.68
× 100	29.4	11.10	10.340	1.120	0.680	623	112	4.60	207	40.0	2.65
× 88	25.9	10.84	10.265	0.990	0.605	534	98.5	4.54	179	34.8	2.63
× 77	22.6	10.60	10.190	0.870	0.530	455	85.9	4.49	154	30.1	2.60
× 60	17.6	10.22	10.080	0.680	0.370	341	66.7	4.39	116	23.0	2.57
× 49	14.4	9.98	10.000	0.560	0.340	272	54.6	4.35	93.4	18.7	2.54
W10 × 45	13.3	10.10	8.020	0.620	0.350	248	49.1	4.32	53.4	13.3	2.01
× 39	11.5	9.92	7.985	0.530	0.315	209	42.1	4.27	45.0	11.3	1.98
× 33	9.71	9.73	7.960	0.435	0.290	170	35.0	4.19	36.6	9.20	1.94
W10 × 30	8.84	10.47	5.810	0.510	0.300	170	32.4	4.38	16.7	5.75	1.37
× 22	6.49	10.17	5.750	0.360	0.240	118	23.2	4.27	11.4	3.97	1.33
W 8 × 67	19.7	9.00	8.280	0.935	0.570	272	60.4	3.72	88.6	21.2	2.12
× 58	17.1	8.75	8.220	0.810	0.510	228	52.0	3.65	75.1	18.3	2.10
× 48	14.1	8.50	8.110	0.685	0.400	184	43.3	3.61	60.9	15.0	2.08
× 40	11.7	8.25	8.070	0.560	0.360	146	35.5	3.53	49.1	12.2	2.04
× 35	10.3	8.12	8.020	0.495	0.310	127	31.2	3.51	42.6	10.6	2.03
× 31	9.13	8.00	8.000	0.435	0.285	110	27.5	3.47	37.1	9.27	2.02
W 8 × 28	8.25	8.06	6.535	0.465	0.285	98.0	24.3	3.45	21.7	6.63	1.62
× 24	7.08	7.93	6.495	0.400	0.245	82.8	20.9	3.42	18.3	5.63	1.61
W 8 × 21	6.16	8.28	5.270	0.400	0.250	75.3	18.2	3.49	9.77	3.71	1.26
× 18	5.26	8.14	5.250	0.330	0.230	61.9	15.2	3.43	7.97	3.04	1.23

L-2/T-2/WRE **Date : 21/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **WRE 201** (Fluid Mechanics)

Full Marks: 280 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

Assume reasonable data, where missing.

1. (a) What are the scope of the subject "Fluid Mechanics"? **(5)**

(b) Illustrate the experiment carried out by Reynolds to demonstrate laminar flow and turbulent flow. **(8)**

(c) Define the following terms: (i) Steady uniform flow, (ii) Newtonian fluid, (iii) Ideal fluid, and (iv) Kinematic viscosity. **(8)**

(d) In a flow field, the velocity vector is given by $V = 7xi - 5yj + 4zk$. **(9)**

Determine the equation of the streamline passing through a point M(1, 3, 4).

(e) An idealized velocity field is given by the formula $V = (3xy)i + (yz^2)j - (2x^2z)k$. Is this flow steady or unsteady? Is it a two- or three-dimensional flow? **(6)**

(f) Three pipes steadily deliver water at 20^0C to a large exit pipe as shown in Figure 1. The velocity V_2 = 5m/s, and the exit flow rate is Q_4 = 120 m^3/hour. **(10⅔)**

Find the velocity (i) V_1, (ii) V_3 and (iii) V_4. It is known that, by increasing Q_3 by 20 percent would increase Q_4 by 10 percent.

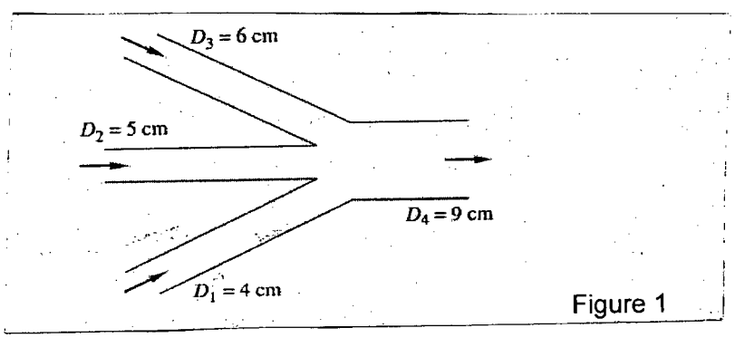


Figure 1

2. (a) Derive the general energy equation for steady flow and for any fluid. **(10)**

(b) Water in a pipe at 36 m above sea level have a velocity of 18 m/s and pressure 350 kN/m^2. Determine the potential, kinetic and pressure energy of the water in meters of head. Also determine the total head. **(6)**

(c) Consider the water siphon shown in Figure 2. Assuming that Bernoulli's equation is valid, (i) find an expression for the velocity V_2 exiting the siphon tube. (ii) If the tube is 1 cm in diameter and z_1 = 60 cm, z_2 = –25 cm, z_3 = 90 cm, and z_4 = 35 cm, estimate the flow rate in cm^3/s. Also find the pressure at point 3. Assume density of water is constant. **(12⅔)**

Contd P/2

WRE 201

Contd... Q. No. 2

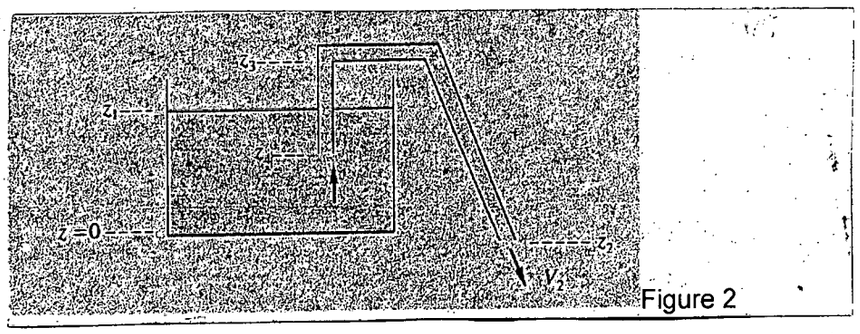


Figure 2

(d) A pipeline delivering water from a reservoir is shown in Figure 3. A pump P adds energy to the flow and 60 liter/sec of water is discharged to atmosphere at the outlet. Calculate the power delivered by the pump. **(18)**

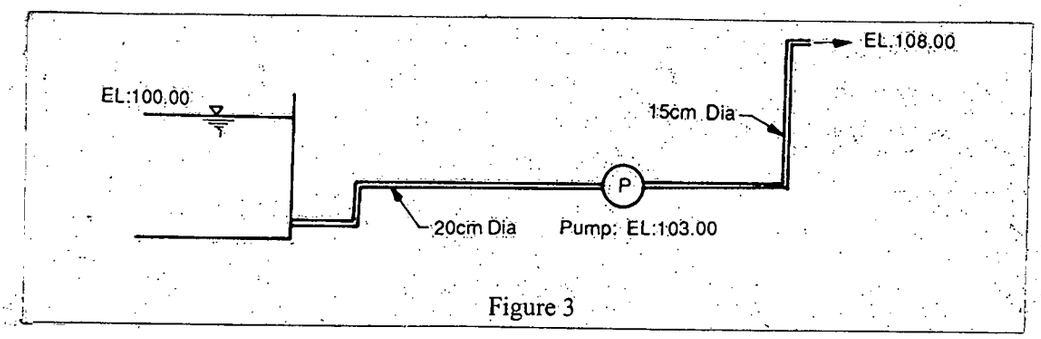


Figure 3

Assume the head loss in the pipe as two times the velocity head at the suction side and 10 times the velocity head in the delivery pipe. Draw a neat sketch showing the hydraulic grade line and the energy line.

3. (a) Derive the momentum equation for a reduced pipe bend. **(7)**

(b) A jet of water strikes a stationary flat plate "perpendicularly" (Figure 4), if the jet diameter is 7.5 cm and its velocity upon impact is 30 m/s, determine the magnitude and direction of the resultant force on the plate. Neglect frictional effect and take density of water as 1000 kg/m^3. **(9⅔)**

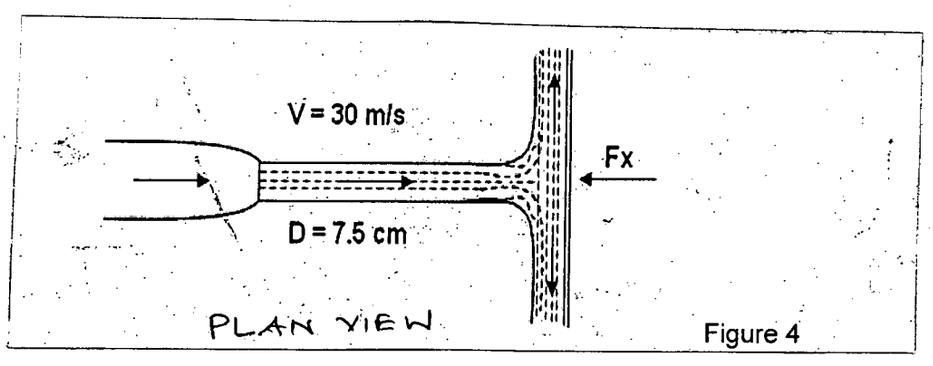


Figure 4

WRE 201

Contd... Q. No. 3

(c) Determine for a single moving vane the force components due to the water jet and the rate of the work done on the vane. Draw the velocity diagram at entrance and the exit. Given that the area of the incoming jet is 0.002 m^2. The absolute velocity of the incoming jet at entrance is 82 m/s and the absolute velocity of the moving vane in the same direction as the original jet is 32 m/s. The vane angle is 150^0. The friction loss is 10%. **(12)**

(d) A centrifugal pump impeller has $r_1 = 0.3$ m, $r_2 = 1.0$ m, $\beta_1 = 120^0$, $\beta_2 = 130^0$ and a thickness of 0.10 m parallel to the axis of rotation. If it delivers 4 m^3/s with no tangential velocity component at the entrance, then what is the rotational speed? For this condition, calculate: **(18)**

(i) Torque
(ii) Power of the machine
(iii) Energy given to each Newton of water.

4. (a) Derive Darcey-Weisbach equation for pipe friction. **(8)**

(b) What is the head loss per meter of pipe when oil (s = 0.90), having viscosity of 9.6×10^{-3} N.s/m^2 flows in a 5 cm diameter welded steel pipe at a discharge of 4.2 litre/s? Here the pipe contains a uniform sand roughness of grain size 0.12 mm. **(8⅔)**

(c) The pipe system shown in Figure 5 are all new cast iron (e = 0.30 mm). The discharge at point A is 1.0 m^3/s. Find the head loss from B to C. Provide your answer with two (2) trials (Given $\nu = 1.12\times10^{-6}$ m^2/s). **(14)**

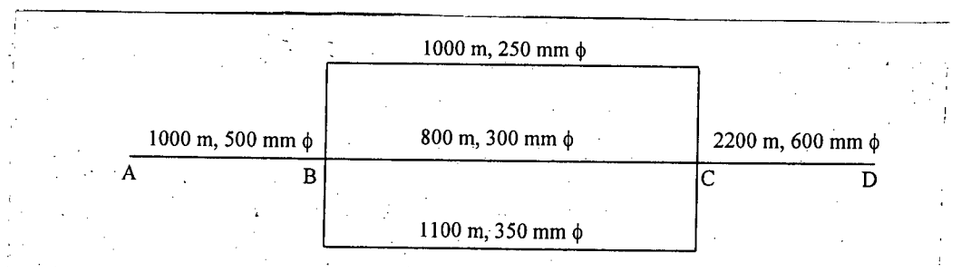


Figure 5

(d) The flows into and out of a two-loop pipe system are shown in Figure 6. Determine the flow in each pipe by Hardy - Cross method. The K values for each pipe were calculated from the pipe and minor loss characteristics are from assumed value of f. The discharges are in liter/sec (L/s). Show only one (1) trial. **(16)**

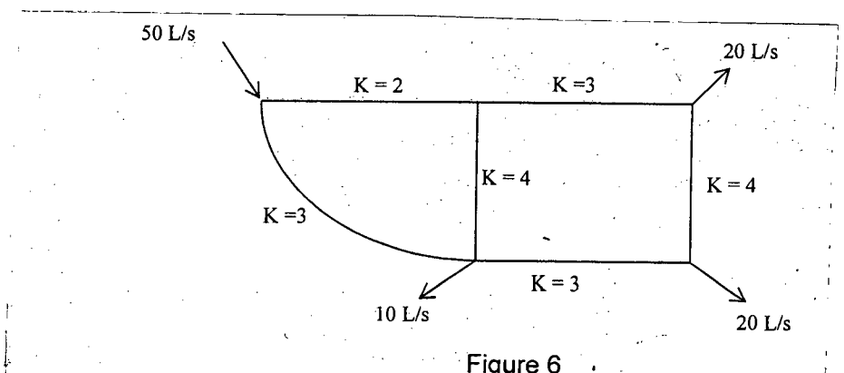


Figure 6

Contd P/4

WRE 201

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) What is viscosity? Derive Newton's equation of viscosity. **(10⅔)**

(b) A fluid of absolute viscosity 10 poise flows past a flat plane and has a velocity of 1.20 m/s at the vertex which is 30 cm from the flat surface. Calculate the velocity gradients and shear stresses at points, 5, 10, 15 and 20 cm from the boundary. Assume a parabolic velocity distribution. **(12)**

(c) Differentiate between: **(6)**

(i) Compressible and incompressible fluid

(ii) Ideal and real fluid

(iii) Adhesion and cohesion

(d) The gate PQ in the Figure 7 rotates about an axis through Q. If the width perpendicular to the plane of the figure is 1.2 m, what torque applied to the shaft through Q is required to hold the gate closed? **(18)**

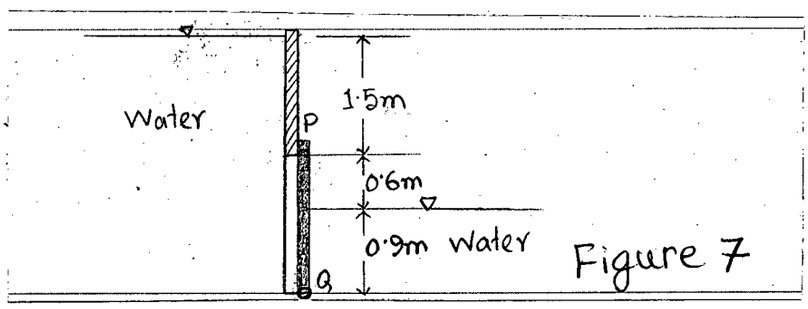


Figure 7

6. (a) Show that, a downward acceleration results in a decrease in pressure within the fluid. **(18)**

(b) At a particular instant an airplane is traveling upward at a velocity of 260 m/s in a direction that makes an angle of 40^0 with the horizontal. At this instant the airplane is losing speed at the rate of 4 m/s^2. Also it is moving on a concave upward circular path having a radius of 2600 m. Determine for the given conditions the position of the free liquid surface in the fuel tank of this vehicle. **(12)**

(c) Briefly describe the pressure measuring mechanism of the following devices **(9)**

(i) Bourdon Gage

(ii) Pressure Transducer

(iii) Differential Manometer

(d) Define absolute pressure, vacuum pressure and gage pressure. How are they interrelated? **(7⅔)**

Contd P/5

WRE 201

7. (a) What is similitude? State the conditions for which flows will achieve dynamic similarity. **(8⅔)**

(b) A ship of 120 m length is to be tested by a model of 3 m long. If the ship travels at 56 km/h, at what speed must the model be towed for dynamic similitude between model and prototype? If drag of the model is 9 N, what prototype drag is to be expected? **(14)**

(c) Define (i) Mach Number; (ii) Weber Number; (iii) Euler Number. **(6)**

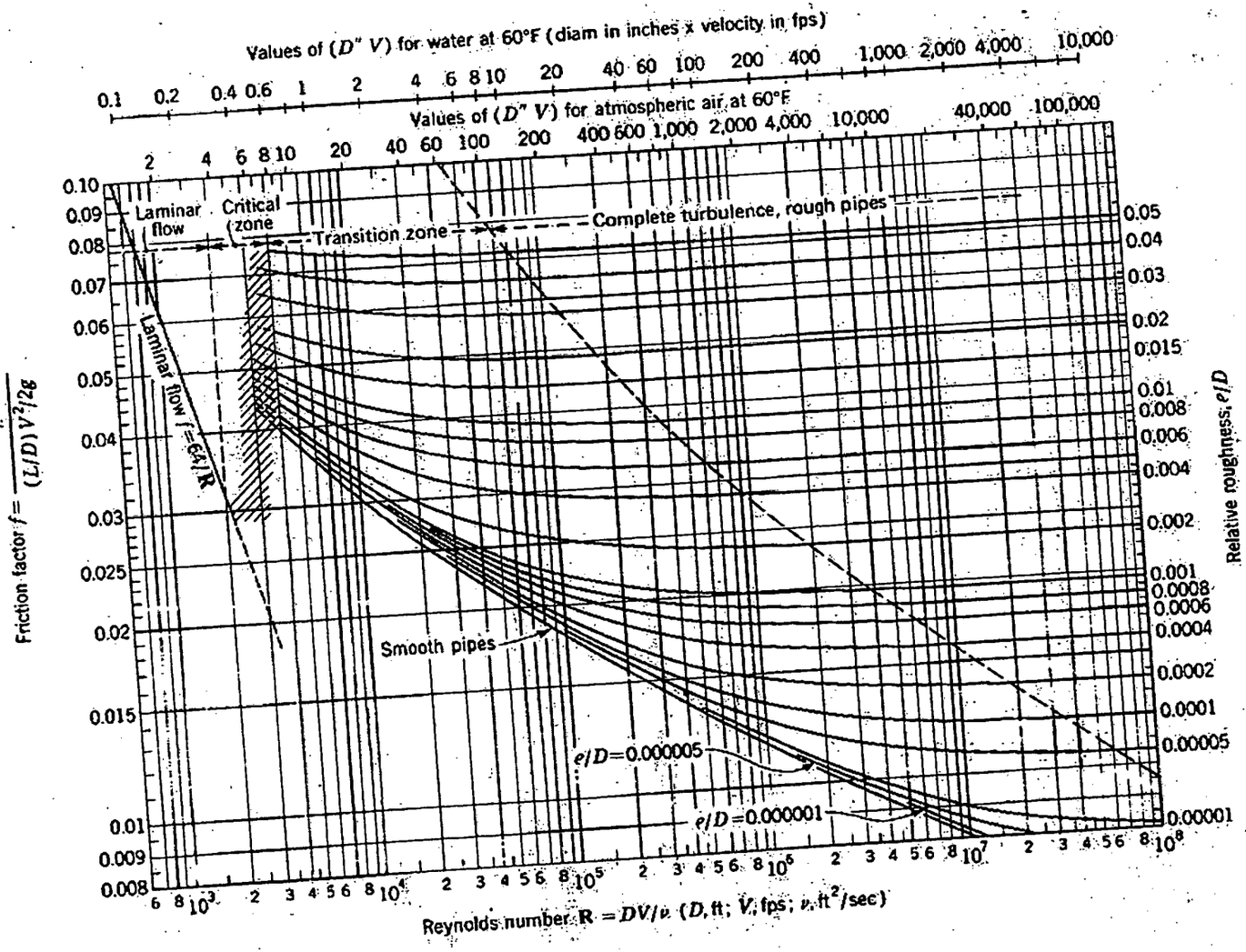
(d) Using dimensional analysis, derive an expression for small flow rates over a spillway, in the form of a function including dimensionless quantities. The parameters involved are height of spillway P, head on the spillway H, acceleration due to gravity g, viscosity of liquid μ, density of liquid ρ and surface tension σ. **(18)**

8. (a) Briefly describe the advantages and disadvantages of different types of viscometer. **(9)**

(b) A 5 cm circular orfice at the end of a 7.5 cm diameter pipe discharges into the atmosphere a measured flow of 17 l/s of water when the pressure in the pipe is 70 kPa. The jet velocity is determined by a pitot tube to be 12 m/s. Find the values of coefficients C_v, C_c and C_d. Also find the head loss for inlet to throat. **(12)**

(c) Prove that the coefficient of discharge of an internal mouthpiece is less than that of an external mouthpiece. **(15⅔)**

(d) Two vessels are connected to a differential manometer using mercury, the connecting tube being filled with water. The higher pressure vessel is 1.5 m lower in elevation than the other. If the mercury reading is 10 cm, what is the pressure difference in m of water? If carbon tetrachloride (s = 1.59) were used instead of mercury, what would be the manometer reading for the same pressure difference? **(10)**


Values of (D" V) for water at 60°F (diam in inches x velocity in fps)
0.1 0.2 0.4 0.6 1 2 4 6 8 10 20 40 60 100 200 400 1,000 2,000 4,000 10,000
Values of (D" V) for atmospheric air at 60°F
2 4 6 8 10 20 40 60 100 200 400 600 1,000 2,000 4,000 10,000 40,000 100,000
Laminar flow
Critical zone
Transition zone
Complete turbulence, rough pipes
Laminar flow f = 64/R
Smooth pipes
e/D=0.000005
e/D=0.000001
Friction factor f = h_f / ((L/D) V²/2g)
Relative roughness, e/D
0.10 0.09 0.08 0.07 0.06 0.05 0.04 0.03 0.025 0.02 0.015 0.01 0.009 0.008
0.05 0.04 0.03 0.02 0.015 0.01 0.008 0.006 0.004 0.002 0.001 0.0008 0.0006 0.0004 0.0002 0.0001 0.00005 0.00001
6 8 10³ 2 3 4 5 6 8 10⁴ 2 3 4 5 6 8 10⁵ 2 3 4 5 6 8 10⁶ 2 3 4 5 6 8 10⁷ 2 3 4 5 6 8 10⁸
Reynolds number R = DV/ν (D, ft; V, fps; ν, ft²/sec)

L-2/T-2/WRE **Date : 25/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **HUM 213** (Government)

Full Marks: 140 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Define state. Discuss the differences between society and state. **(11 ⅓)**

   (b) What is constitution? Analyze different types of constitution with examples. **(12)**

2. (a) Explain the political rights and duties of a citizen in a state. **(11 ⅓)**

   (b) Make a comparative discussion between democracy and dictatorship. **(12)**

3. (a) What are the different kinds of executive? Describe the functions of the executive in a state. **(11 ⅓)**

   (b) What is meant by bureaucracy? Why has bureaucracy overdeveloped in post colonial states? **(12)**

4. Write short notes on any **three (3)** of the following: **(23 ⅓)**
   (a) Bicameral Legislature
   (b) Popular Sovereignty
   (c) Good Governance
   (d) Independence of Judiciary

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Discuss the importance of the language movement of 1952. **(11 ⅓)**

   (b) Describe the eleven-point programme of the mass-upsurge of 1969. **(12)**

6. (a) Define constitution. Discuss the amendment procedure of Bangladesh Constitution. **(11 ⅓)**

   (b) Discuss the principles of Bangladesh foreign policy. **(12)**

7. (a) Make a comparison between the political systems of UK and USA. **(11 ⅓)**

   (b) Discuss the power and functions of the president of USA. **(12)**

8. (a) What is local government? Discuss the activities of the rural local government in Bangladesh. **(11 ⅓)**

   (b) Critically explain the functions of the United Nations Organization. **(12)**

L-2/T-2/WRE **Date : 25/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **HUM 211** (Sociology)

Full Marks: 140 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) What major environmental problems now challenge the ecosystems of modern industrial societies? Discuss. **(6)**

   (b) Discuss why technology cannot solve all the problems of diminishing resources and environmental pollution. **(6)**

   (c) Briefly describe how the socio-economic development depends on physical environment. **(11 ⅓)**

2. (a) What impact did the industrial revolution have on societies? **(10)**

   (b) Illustrate the negative impacts of capitalism on a society. **(7)**

   (c) Critically discuss how the technological developments have changed our social and economic life. **(6 ⅓)**

3. (a) 'A large population means a low standard of living'. Do you agree? What is the relation between standard of living and population? **(11 ⅓)**

   (b) What are the socio-economic differences between 'pre-industrial societies', 'industrial societies' and 'post-industrial' societies? **(12)**

4. Write short notes on any **three** of the following: **(23 ⅓)**

   (a) Globalization and modern life

   (b) Social change

   (c) Urbanization and Urbanism

   (d) Water pollution.

Contd P/2

HUM 211/WRE

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (b) 'Socialization is a life long continuous learning process' — Explain this statement highlighting Sigmund Freud's psychoanalysis model. **(10)**

   (b) How would you explain H. M. Johnson's method of successful learning? **(13 ⅓)**

6. (a) Define deviant behaviour. Illustrate the positive contribution of deviant behaviour. **(10)**

   (b) Evaluate Emile Durkheim's arguments of deviant behaviour of modern industrial society. **(13 ⅓)**

7. (a) 'Social stratification is universal' — Explain with examples. **(10)**

   (b) What is social mobility? Discuss various systems of social mobility. **(13 ⅓)**

8. Write short notes on any **three** of the following: **(23 ⅓)**

   (a) ethnocentrism,

   (b) cultural lag,

   (c) dominant ideology,

   (d) agents of socialization.

L-2/T-2/WRE **Date : 30/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **WRE 205** (Numerical Methods)

Full Marks: 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

Use reasonable value for any missing data. Notations and symbols have their usual meaning.

1. (a) What do you understand by Curve Fitting? **(2)**

   (b) Fit a second-degree parabola to the following data (using the Centre Value as origin) by least squares method. **(12)**

x	1929	1930	1931	1932	1933	1934	1935	1936	1937
y	352	356	357	358	360	361	361	360	359

   (c) Derive the five point difference formula. **(9 ⅓)**

2. (a) Derive Newton-Gregory Backward Difference Formula. **(11 ⅓)**

   (b) The ages of the members of a locality were found as below: **(12)**

Age (year)	No. of members
0 – 19	41
20 – 39	62
40 – 59	65
60 – 79	50
80 – 99	17

   Estimate the number of members who were below 70 years.

3. (a) To get $0(h^6)$ accuracy in Romberg Iteration, Show that $I = I_1 + (I_1 - I_2)/15$. **(7 ⅓)**

   (b) Using Runge-Kutta method of order four, find y at x = 1.1 and 1.2 by solving $y' = x^2 + y^2$, $y(1) = 2.3$. Compare your results using the Heun Method. Use step-length = 0.1. **(16)**

4. (a) Obtain the table of divided differences and find **f(0.25)** for **(13)**

x	0.1	0.2	0.3	0.4	0.5
f	9.9833	4.9667	3.2836	2.4339	1.9177

   (b) Solve the differential equation $y' = x/y$, $y(0) = 1$ by Euler's method to get y(1). Use the step lengths h = 0.1 and 0.2 and compare the results with the analytical solution ($y^2 = 1 + x^2$). **(10 ⅓)**

Contd P/2

WRE 205

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Distinguish between explicit and implicit schemes. **(3⅓)**

(b) Derive generic formulae for $\sqrt[p]{a}$ and a^{-1} using the Newton-Raphson method. **(8)**

(c) Solve the following system of linear equations using LU decomposition method. **(12)**

$$3x+2y+z=10$$
$$2x+3y+2z=14$$
$$x+2y+3z=14$$

6. (a) Differentiate between rounding error and truncation error. **(3⅓)**

(b) Solve the following system of linear equations using the Gauss-Seidal iterative method. (Do minimum three iterations.) **(10)**

$$10x_1+7x_2+8x_3+7x_4=32$$
$$7x_1+5x_2+6x_3+5x_4=23$$
$$8x_1+6x_2+10x_3+9x_4=33$$
$$7x_1+5x_2+9x_3+10x_4=31$$

(c) Solve the following nonlinear system of equations using the Newton-Raphson method. (Do at least two iterations.) In your solution pick the initial values as x = 1, y = 0.5. **(10)**

$$f(x,y)=\sin x-y^2=0$$
$$g(x,y)=xy-2=0$$

7. (a) Show that the method of bisection converges linearly with a factor of 0.5. **(3⅓)**

(b) Find a root for the following equation using the Regular Falsi method. Start with the values $x_1 = 2$, $x_2 = 3$. (Do at least five iterations.) **(10)**

$$f(x)=\sin x-\frac{x-1}{x}=0$$

(c) Find a root of the following equation using Newton-Raphson method. (correct up to four decimal places.) **(10)**

$$e^x+3x-2.56=0$$

8. (a) List down the direct and indirect methods available for solving linear system of algebraic equations. **(3⅓)**

(b) Prove that the truncation errors for the forward and backward differences are of the first order, and that for the central difference is of the second order. **(8)**

(c) A function is given by $f(x)=4+2x+3x^2+4x^3$. **(12)**

(i) Using the values of the function and its derivatives at x = 1, determine the values of the function at x = 1.05 with the help of the Taylor series expansion and compare these values with the actual values of the function.

(ii) Taking $\Delta x = 0.05$ determine the % of error of forward, backward and central differences of the first derivative and of the second derivative with respect to the point where x = 1.
