(1). (a). With aid of a diagram, EXPLAIN the meaning of atmospheric pressure, absolute pressure, gauge pressure, compound pressure, barometric pressure and vacuum pressure.

Dengan bantuan sebuah rajah, TERANGKAN maksud tekanan atmosfera, tekanan mutlak, tekanan tolok, tekanan kompaun, tekanan baromatik dan tekanan vakum.

(7 marks/*markah*)

(b). Water is flowing from section 1 to section 2 of a pipe. At section 1, which is 25 mm in diameter, the gauge pressure is 345 kPa (p_1) and the velocity of flow is 3.0 m/s. Section 2, which is 50 mm in diameter, is 2.0 m above section 1. Defining there are no energy losses in the said system, CALCULATE the pressure p_2. EVALUATE what would be the gradual difference of p_2, if the pipe end (section 2 only) is lifted gradually to 3.0 m above section 1.

Air mengalir dari seksyen 1 ke seksyen 2 sebatang paip. Pada seksyen 1, yang berukuran 25 mm diameter, tekanan tolok ialah 345 kPa (p_1) dan halaju aliran ialah 3.0 m/s. Seksyen 2, berukuran 50 mm diameter, ialah 2.0 m di atas seksyen 1. Dengan definisi tiada kehilangan tenaga dalam sistem tersebut, KIRAKAN tekanan p_2. NILAIKAN apakah perubahan beransur bagi p_2, jika hujung paip (seksyen 2 sahaja) dinaikkan beransur-ansur sehingga 3.0 m lebih tinggi dari seksyen 1.

(13 marks/*markah*)

(2). (a). With aid of diagrams, CLARIFY the TWO major difference regarding the stability for floating and immersed bodies.

Dengan bantuan rajah-rajah, JELASKAN DUA perbezaan utama berkenaan kestabilan jasad terapung dan tenggelam.

(6 marks/*markah*)

(b). A cube measuring 0.25 m on a side is made of metal V having a specific weight of 58.9 kN/m^3. DETERMINE the magnitude and direction of the force required to hold the cube in equilibrium completely submerged (a) in water. (b) in liquid G, and (c) in mercury. The specific gravity of liquid G and mercury are 6.2 and 13.54, respectively. PROVIDE your opinion on the calculation findings.

Sebuah kiub berukuran 0.25 m pada satu sisi diperbuat dari logam V mempunyai berat spesifik 38.9 kN/m3. TENTUKAN magnitud dan arah daya yang diperlukan bagi menahan kiub dalam keseimbangan dan tenggelam sepenuhnya (a) dalam air, (b) dalam cecair G dan (c) dalam merkuri. Graviti spesifik bagi cecair G dan merkuri adalah 6.2 dan 13.54 masing-masing. BERIKAN pendapat anda berkenaan penemuan pengiraan tersebut.

(14 marks/*markah*)

(3). (a). Four tires of a car are each measured to a gauge pressure at 220 kPa. Each tire has an area of 0.025 m^2 in contact with the road surface. ESTIMATE the weight of the car through possible calculation, PROVIDING ONE definition/assumption. SUGGEST what would happen when 200 kg of gold is transferred into the boot (at the back) of the car. EXPLAIN how would this relates to a car's tire pressure management?

Empat tayar sebuah kereta diukur tekanan tolok setiap satunya pada 220 kPa. Setiap tayar mempunyai luas 0.025 m^2 bersentuhan dengan permukaan jalan. Berikan ANGGARAN berat kereta dengan pengiraan yang mungkin, dengan MEMBERIKAN SATU definisi/andaian. CADANGKAN apakah yang akan berlaku jika 200 kg emas dipindahkan ke dalam but (di bahagian belakang) kereta tersebut. TERANGKAN bagaimana ini berkaitan dengan pengurusan tekanan tayar kereta.

(9 marks/*markah*)

(b). A manometer connected to a pipe indicates a negative gauge pressure of 50 mm of mercury (s.g. 13.6). What is the absolute pressure in the pipe in Newtons per square meter, if the atmospheric pressure is 1.013 bar?

Sebuah manometer yang disambungkan kepada paip menunjukkan tekanan tolok negatif sebanyak 50 mm merkuri (s.g. 13.6). Apakah tekanan mutlak dalam paip tersebut, dalam Newton per meter persegi, jika tekanan atmosferik ialah 1.013 bar?

(4 marks/*markah*)

(c). A typical barometer was designed using saltwater, of density 1045 kg/m^3, as the working liquid. CALCULATE the minimum height (h) of that barometer for measuring normal atmospheric pressure. SUGGEST THREE reasons why saltwater, in this case, can be inferior to mercury for pressure measurement purposes.

Sebuah barometer tipikal telah direkabentuk menggunakan air garam dengan ketumpatan 1045 kg/m^3 sebagai cecair kerja. HITUNG ketinggian (h) minima bagi barometer tersebut untuk mengukur tekanan atmosfera normal. CADANGKAN TIGA sebab

mengapa air garam, dalam kes ini, kurang berkesan berbanding merkuri bagi kerja-kerja pengukuran tekanan.

(7 marks/*markah*)

(4). (a). Name the four combinations of free-surface flow classification.
Namakan empat klasifikasi aliran permukaan bebas.

(4 marks/*markah*)

(b). Determine the energy loss if glycerin at 25°C flows 30 m through a 150-mm-diameter pipe with an average velocity of 4.0 m/s Use fluid properties from Table 1.

Hitungkan kehilangan tenaga jika gliserin pada 25°C mengalir sepanjang 30 m melalui paip berdiameter 150 mm dengan kelajuan purata 4.0 m/s. Gunakan ciri-ciri bendalir daripada Jadual 1.

Table 1: Fluid Properties at 25°C / *Jadual 1:Sifat bendalir pada 25°C*

Fluid	Specific Gravity SG	Specific Weight γ (kN/m^3)	Density ρ (kg/m^3)	Dynamic Viscosity, μ (Pa•S)	Kinematic Viscosity, v (m^2/s)
Ethylene glycol	1.100	10.79	1100	1.62×10^{-2}	1.47×10^{-5}
Gasoline	0.68	6.67	680	2.87×10^{-4}	4.22×10^{-7}
Glycerine	1.258	12.34	1258	9.60×10^{-1}	7.63×10^{-4}
Kerosene	0.823	8.07	823	1.64×10^{-3}	1.99×10^{-6}
Linseed oil	0.930	9.12	930	3.31×10^{-2}	3.56×10^{-5}
Mercury	13.54	132.8	13540	1.53×10^{-3}	1.13×10^{-7}
Propane	0.495	4.86	495	1.10×10^{-4}	2.22×10^{-7}
Seawater	1.030	10.10	1030	1.03×10^{-3}	1.00×10^{-6}
Turpentine	0.870	8.53	870	1.37×10^{-3}	1.57×10^{-6}
Fuel oil, medium	0.852	8.36	852	2.99×10^{-3}	3.51×10^{-6}
Fuel oil, heavy	0.906	8.89	906	1.07×10^{-1}	1.18×10^{-4}

(16 marks/*markah*)

(5). (a). Name two type of flow with their limited values.
Namakan dua jenis pengaliran dengan nilai hadnya

(4 marks/*markah*)

(b). Oil, with ρ=900 kg/m^3 and v=0.00001 m^2/s, flows at 0.2 m^3/s through 500 m of 200-mm-diameter cast iron pipe. Determine (a) the head loss and (b) the pressure drop if the pipe slopes down at 10^o in the flow direction.
Minyak dengan ρ=900 kg/m^3 and v=0.00001 m^2/s, mengalir pada 0.2 m^3/s dalam paip besi tuangan berdiameter 200-mm sepanjang 500 m. Hitungkan (a) kehilangan tenaga dan (b) penurunan tekanan jika kecerunan paip menurun sebanyak 10^o dalam arah pengaliran.

(16 marks/*markah*)

(6). (a). Name three piping systems.

Namakan tiga jenis sistem pempaipan.

(6 marks/*markah*)

(b). Compute the flow distribution in the parallel network shown in Figure 1. Assume constant friction factors. The change in hydraulic grade line between A and B is $(p/\gamma + z)_A - (p/\gamma + z)_B = 50$ m.

Kirakan agihan aliran dalam rangkaian selari ditunjukkan dalam rajah 1. Andaikan faktor geseran malar. Perubahan garisan gred hidrolik antara A dan B adalah $(p/\gamma + z)_A - (p/\gamma + z)_B = 50$ *m.*

(14 marks/*markah*)

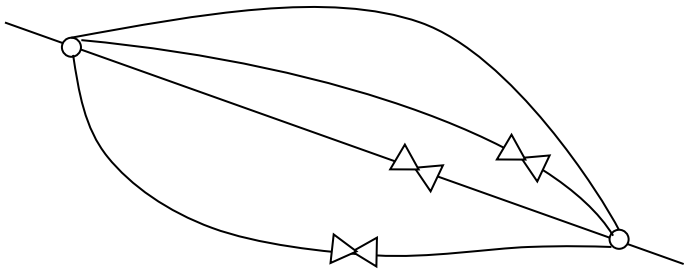

Figure 1 / *Rajah 1*

Pipe	e (mm)	D (mm)	e/D
1	0.1	1000	0.0001
2	0.15	1200	0.000125
3	0.2	850	0.000235
4	0.1	1000	0.0001

Table 2 / *Jadual 2*

Pipe	L (m)	D (mm)	e (mm)	∑ K
1	600	1000	0.1	2
2	1000	1200	0.15	0
3	550	850	0.2	4
4	800	1000	0.1	1

Table 3 / *Jadual 3*

		ϵ		
Material	**Condition**	**ft**	**mm**	**Uncertainty, %**
Steel	Sheet metal, new	0.00016	0.05	±60
	Stainless, new	0.000007	0.002	±50
	Commercial, new	0.00015	0.046	±30
	Riveted	0.01	3.0	±70
	Rusted	0.007	2.0	±50
Iron	Cast, new	0.00085	0.26	±50
	Wrought, new	0.00015	0.046	±20
	Galvanized, new	0.0005	0.15	±40
	Asphalted cast	0.0004	0.12	±50
Brass	Drawn, new	0.000007	0.002	±50
Plastic	Drawn tubing	0.000005	0.0015	±60
Glass	—	Smooth	Smooth	
Concrete	Smoothed	0.00013	0.04	±60
	Rough	0.007	2.0	±50
Rubber	Smoothed	0.000033	0.01	±60
Wood	Stave	0.0016	0.5	±40

Table 4 / *Jadual 4*

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