UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2008/2009

April/May 2009

REG 261 – Building Services
[Perkhidmatan Bangunan]

Duration: 3 hours
[Masa: 3 jam]

Please check that this examination paper consists of NINE printed pages before you begin the examination.

Sila pastikan bahawa kertas peperiksaan ini mengandungi SEMBILAN muka surat yang tercetak sebelum anda memulakan peperiksaan ini.

Students are allowed to answer all questions either in English OR in Bahasa Malaysia only.

Pelajar dibenarkan menjawab semua soalan dalam Bahasa Inggeris ATAU Bahasa Malaysia sahaja.

Answer **FIVE** questions only.

*Jawab **LIMA** soalan sahaja.*

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1. You have been assigned to plan the water supply system for a 10 storey luxury apartment. The water pressure for the top two floors is low if they were to receive water supply from the roof water tank. A pneumatic cylinder is normally used to overcome this problem.

With the aid of sketches, describe how a pneumatic cylinder works to deliver water with adequate pressure to the top two floors of the apartment.

Anda ditugaskan untuk merancang sistem bekalan air untuk satu bangunan pangsapuri mewah 10 tingkat. Tekanan paip air untuk dua tingkat teratas pangsapuri adalah rendah jika ianya menerima bekalan air dari tangki air atas bumbung. Silinder pneumatik biasanya digunakan untuk mengatasi masalah ini.

Dengan bantuan lakaran, huraikan bagaimana silinder pneumatik boleh menyalurkan bekalan air dengan tekanan yang mencukupi kepada tingkat dua teratas pangsapuri tersebut.

(20 marks/*markah)*

2. The well-designed and correctly installed plumbing system is odorless. Odors is most likely to arise from leaks in the waste/vent piping or from traps which have lost their water seal.

With the aid of sketches, describe **FOUR** phenomenons water seals in traps are lost and the method used to overcome this problem.

Sistem bekalan paip air yang betul dan direkabentuk dengan baik tidak berbau. Bau biasanya terhasil dari kebocoran paip sisa/pengudaraan atau perangkap yang telah hilang takungan air.

*Dengan bantuan lakaran, huraikan **EMPAT** fenomena takungan air dalam perangkap boleh hilang dan kaedah yang digunakan untuk mengatasi masalah ini.*

(20 marks/*markah)*

3. You have been assigned to plan the toilet facility of a 5-star exclusive clubhouse. With the aid of sketches, describe **FIVE** main characteristics that a good designed toilet should have taking into consideration the following factors:-

- Layout,
- Lighting,
- Construction material,
- Sanitary Appliances (wash basin, water closet and urinal),
- Ventilation,
- Basic amenities and the needs of the handicapped.

*Anda ditugaskan untuk merancang kemudahan tandas sebuah rumahkelab eksklusif 5-bintang. Dengan bantuan lakaran, huraikan **LIMA** ciri utama yang perlu ada bagi satu tandas yang direkabentuk dengan baik dengan mengambil kira faktor berikut:-*

- *Tatatur,*
- *Pencahayaan,*
- *Bahan binaan,*
- *Peralatan sanitari (besin basuh tangan, mangkuk tandas dan urinal),*
- *Pengudaraan,*
- *Kemudahan asas dan keperluan warga handicap.*

(20 marks/*markah)*

4. (a) List down **FOUR** types of mechanical ventilation. With the aid of sketches, discuss the principal operation of one of the systems that you have listed down.

*Senaraikan **EMPAT** jenis sistem pengudaraan mekanikal. Dengan bantuan lakaran, bincangkan prinsip operasi satu daripada sistem yang disenaraikan.*

(8 marks/m*arkah*)

(b) The dimension of an office space is given as 20 m length, 7.5 m width and 3.5 m height. By referring to the attached tables and charts, determine:-

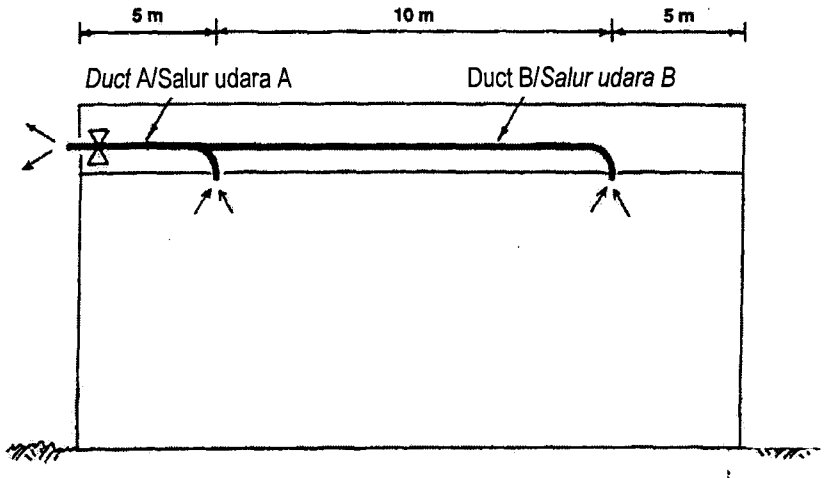
(i) Duct sizes (use equal velocity method)

(ii) Fan rating

Diberi satu ruang pejabat berukuran 20 m panjang, 7.5 m lebar dan 3.5 m tinggi. Dengan berpandukan maklumat dan jadual serta carta yang diberi, tentukan:-

(i) Saiz salur udara (gunakan kaedah halaju setara)

(ii) Keupayaan kipas



Not to scale /*Tidak mengikut skala*

(12 marks/*markah*)

5. (a) List down **FOUR** air-conditioning systems. Discuss the advantages and disadvantages one of the systems that you have listed down.

*Senaraikan **EMPAT** jenis sistem penghawa dingin. Bincangkan kebaikan dan kelemahan satu daripada sistem yang disenaraikan.*

(8 marks/*markah*)

(b) An air-conditioning system ductwork contains return air at 20°C db and 14°C wb, mixing with fresh air 35°C db and 24°C wb before processing in an air-handling unit. If the ratio of mixed air (return air : fresh air) is 3 : 1, plot the conditions of mixed air on the psychrometric chart.

(i) Wb and db temperature

(ii) Relative humidity (RH)

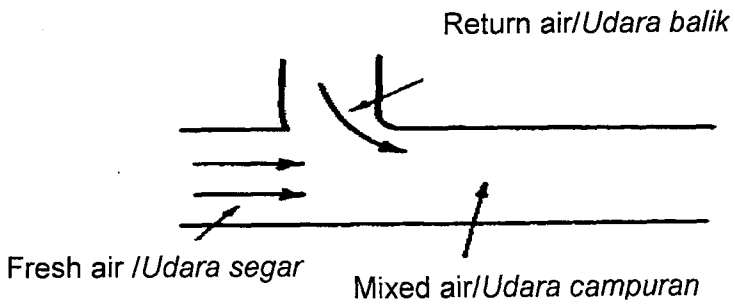
(iii) Moisture content

Satu saluran udara sistem penyamanan udara mengandungi udara balik pada keadaan 20°C bk dan 14°C bb yang kemudiannya bercampur dengan udara segar pada keadaan 35°C bk dan 24°C bb sebelum diproses di dalam unit pengelolaan udara. Jika nisbah campuran udara balik kepada udara segar ialah 3 : 1, plotkan keadaan berikut pada carta psychrometric bagi udara campuran yang dihasilkan.

(i) Suhu bk dan bb

(ii) Kelembapan relatif (RH)

(iii) Kandungan lembapan



(12 marks/*markah*)

6. (a) With the aid of sketches, discuss the differences in the installation of dry riser and wet riser.

Dengan bantuan lakaran, bincangkan perbezaan antara pemasangan riser kering dan riser basah.

(8 marks/*markah*)

(b) An office block with 20 storeys above ground floor having a group of four lifts with unified starting and stopping times is to have a floor area above the ground floor of 8000 m^2 and floor height of 3 m. Each car of the lifts has a capacity of 20 persons and a speed of 2.5 ms^{-1}. The clear door width is to be 1.1 m and the doors are to open at a speed of 0.4 ms^{-1}. Estimate the round trip time (RTT)

Sebuah bangunan setinggi 20 tingkat dari aras tanah dengan keluasan lantai 8000 m^2 dan ketinggian lantai 3 m mempunyai sekumpulan empat buah lif dengan masa permulaan dan masa berhenti adalah secara penyatuan. Setiap lif mempunyai kapasiti 20 orang dan kelajuan 2.5 ms^{-1}. Lebar bukaan pintu adalah 1.1 m dan dibuka pada kelajuan 0.4 ms^{-1}. Anggarkan masa perjalanan (RTT).

(12 marks/*markah*)

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ATTACHMENT FOR QUESTIONS 4
LAMPIRAN UNTUK SOALAN 4

1. (a) Air change rate table
Jadual kadar pertukaran udara

Accommodation	Air changes per hour
Offices – above ground	2–6
Offices – below ground	10–20
Factories – large, open	1–4
Factories/industrial units	6–8
Workshops with unhealthy fumes	20–30
Fabric manufacturing/processing	10–20
Kitchens – above ground	20–40
Kitchens – below ground	40–60
Public lavatories	6–12
Boiler accommodation/plant rooms	10–15
Foundries	8–15
Laboratories	10–12
Hospital operating theatres	<20
Hospital treatment rooms	<10
Restaurants	10–15
Smoking rooms	10–15
Storage/warehousing	1–2
Assembly halls	3–6
Classrooms	3–4
Domestic habitable rooms	Approx. 1
Lobbies/corridors	3–4
Libraries	2–4

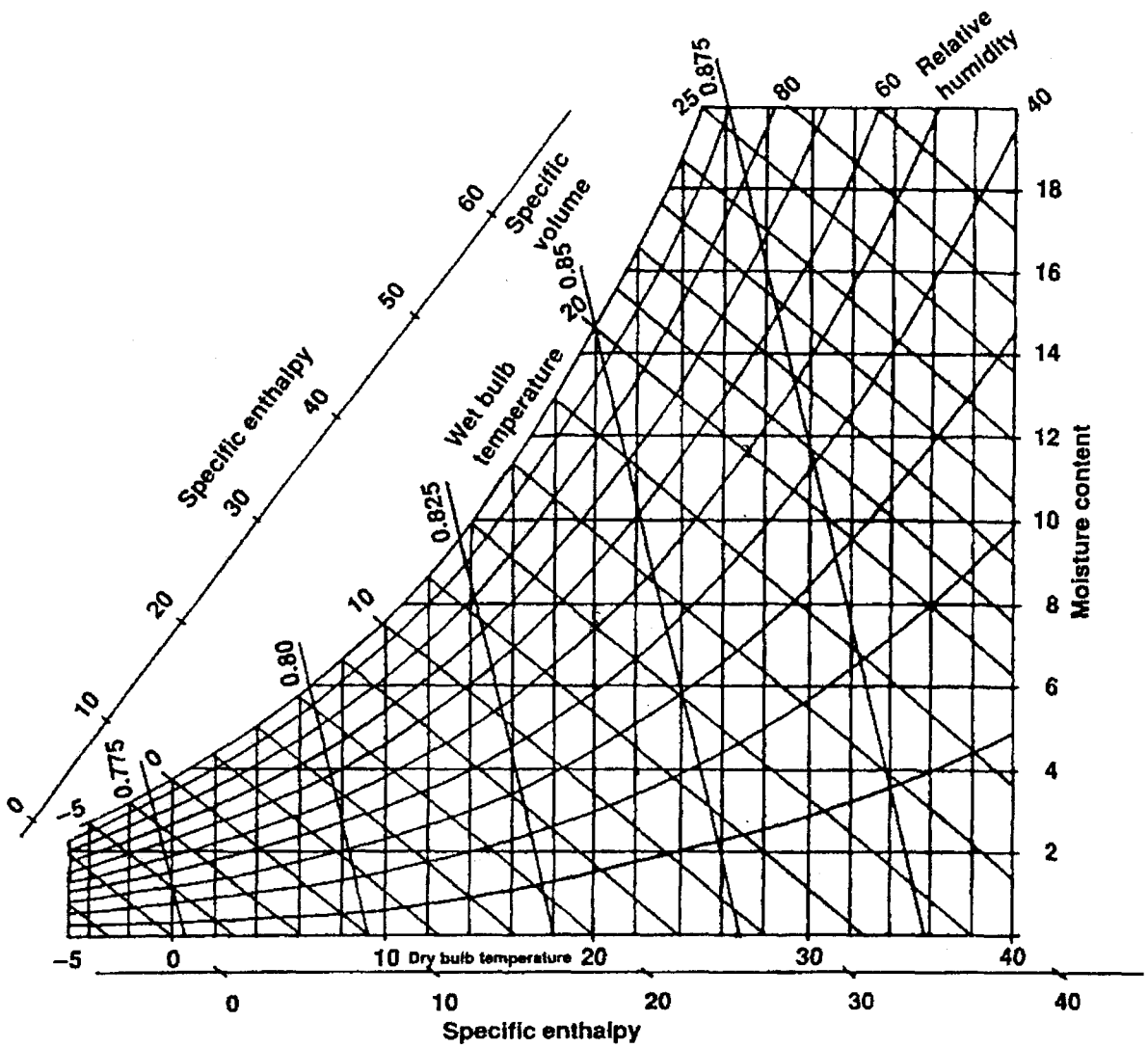
(b) Recommended air velocity table
Jadual halaju udara yang dicadangkan

Application	Maximum air velocity (m/s)	Maximum resistance or pressure drop (Pa/m)
Extremely quiet situations such as reading rooms, recording studios and operating theatres	2.5	0.4
Fairly quiet locations, e.g. church, dwellings, private rooms, offices, hospital wards, commercial premises, theatres, restaurants, public buildings, classrooms and conference facilities	6.0	0.6
Less critical situations, such as exhibition centres, factories, workshops, gyms, departmental stores, cafes/fast food centres, warehousing, etc.	10.0	0.8

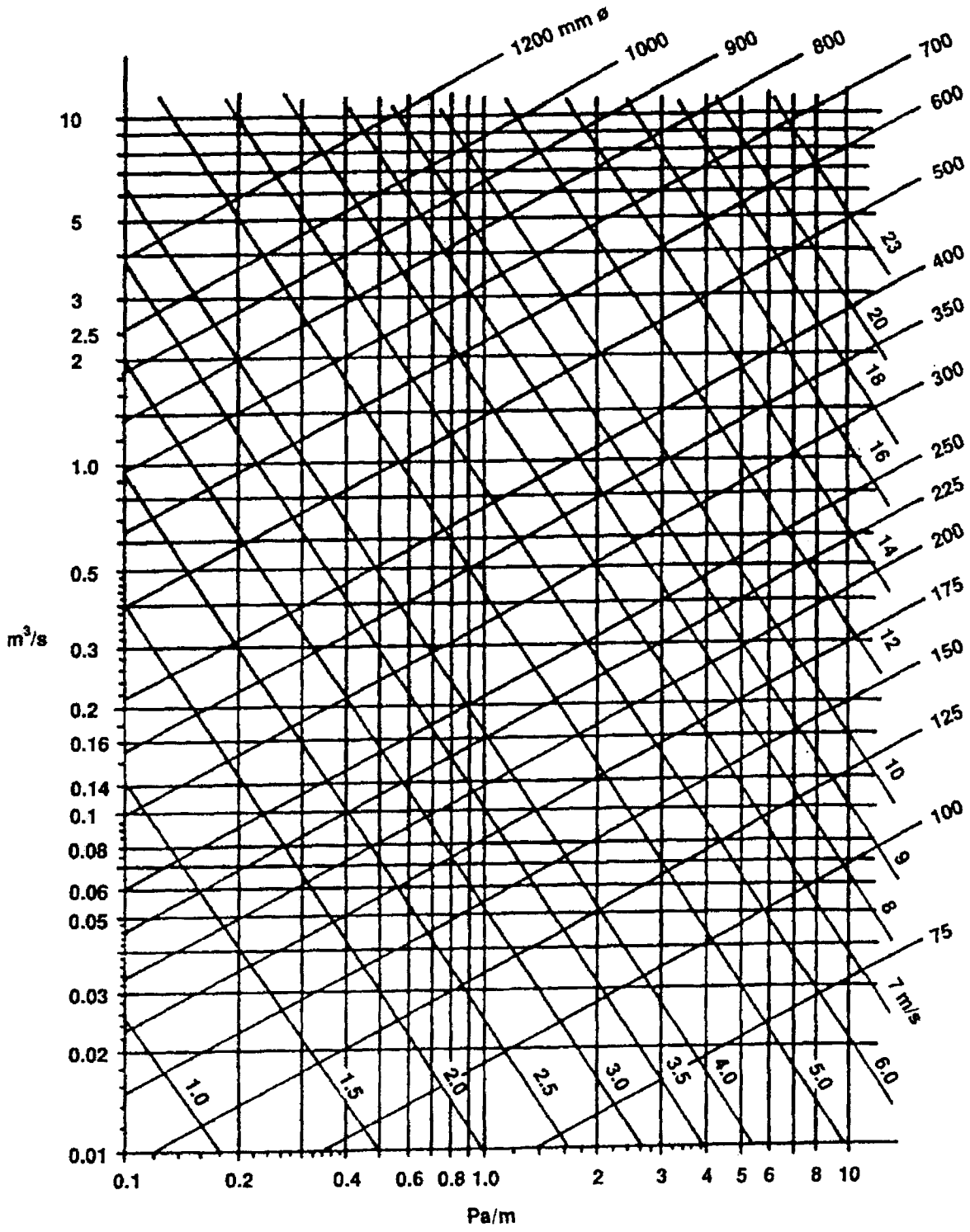
ATTACHEMENT FOR QUESTION 5
LAMPIRAN UNTUK SOALAN 5

To submit together with answer script/*Sertakan dengan kertas jawapan*

2. Psychrometric chart/*Carta psychrometric*



3. Air duct design chart
Carta rekabentuk salur udara



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