COURSE CODE : SKAA 2032 / SAB 2032/ SAM 3012
COURSE : MECHANICAL AND ELECTRICAL SYSTEM
PROGRAMME : SKAW / SAW
DURATION : 2 HOURS
DATE : JANUARY, 2013

INSTRUCTION TO CANDIDATES:
1. SECTION A AND B MUST BE WRITTEN IN SEPARATE BOOKS.

SECTION A : ELECTRICAL
1. ANSWER TWO (2) QUESTIONS FROM SECTION A.
2. ALL CALCULATIONS MUST BE CLEARLY SHOWN.

SECTION B : MECHANICAL
1. ANSWER TWO (2) QUESTIONS FROM SECTION B.
2. ALL VALUES ARE AS USED IN LECTURE NOTES

WARNING!
Students caught copying/cheating during the examination will be liable for disciplinary actions and the faculty may recommend the student to be expelled from the study.

This examination question consists of ( 7 ) printed pages only.
Semua Pelajar
Program Pengajian Separuh Masa
Universiti Teknologi Malaysia

Saudara/i,

PERINGATAN KHAS PEPERIKSAAN


2. Tindakan tatatertib boleh dikenakan ke atas mana-mana pelajar yang ditangkap kerana kesalahan seperti di atas dan jika disabit kesalahan boleh dihukum melalui Peruntukan Kaedah 48, Bahagian V, Tatacara Tatatertib, Kaedah-Kaedah Universiti Teknologi Malaysia (Tatatertib Pelajar-Pelajar) 1999, yang membawa hukuman maksima seperti “digantung daripada pengajian” atau “dipecat” dari Universiti Teknologi Malaysia. Hukuman juga boleh berdasarkan Peraturan Akademik, UTM Bahagian XIII yang membawa hukuman maksima “membatalkan keputusan keseluruhan peperiksaan dan diberhentikan daripada pengajian”.

3. Pihak Universiti tidak teragak-agak untuk mengambil tindakan dan menjatuhkan hukuman maksima jika saudara/i didapati bersalah dalam melakukan penyelewengan akademik.

Sekian.

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Sekolah Pendidikan Profesional dan Pendidikan Berterusan (UTMSpace)
Universiti Teknologi Malaysia

2 Januari 2013
SECTION A: ELECTRICAL

Q1. (a) Explain and give examples for the electrical terms below:
   i) electrical energy source (2 marks)
   ii) electrical load (2 marks)
   iii) electrical transmission system (2 marks)
   iv) electrical control apparatuses (2 marks)
   v) electrical insulator (2 marks)

(b) Sketch the diagram for an electrical power system; from the electrical source, up to the consumer. (5 marks)

(c) A 3-phase, star-connected alternator delivers a line current of 70 A to a balanced delta-connected load at a line voltage of 415 V.
   i) Draw the circuit for the system which shows all the connection at/between alternator and load. Label the line voltages and line currents (4 marks)
   ii) Determine the phase voltage and phase current of the alternator (3 marks)
   iii) Determine the phase voltage and phase current at the load (3 marks) (25 marks)
Q2. (a) Describe the working principle of a transformer with the aid of related figure.  
(b) Explain the functions of cooling systems used in transformers. Give examples of the type of cooling system available.  
(c) A 100kVA, 4000V/200V, 50Hz single-phase transformer has 100 secondary turns. Determine:  
   i) the primary current  
      (2 marks)  
   ii) the secondary current  
      (2 marks)  
   iii) the number of primary turns  
      (2 marks)  
   iv) the maximum value of the flux  
      (2 marks)  
(d) A transformer has a rated output of 200 kVA at a power factor of 0.8. Find:  
   i) the corresponding true power  
      (2 marks)  
   ii) the reactive power  
      (2 marks)  
(e) The daily usage of electrical appliances for a household is given as follows:  
   - 1 unit air conditioner (900 watt each) : 6 hours  
   - 1 unit washing machine (400 watt each) : 2 hours  
   - 1 unit television (250 watt each) : 5 hours  
   - 1 unit refrigerator (500 watt each) : 24 hours  
   - 1 unit computer (500 watt each) : 6 hours  
   - 5 units lighting bulb (15 watt each) : 8 hours  
If the energy cost is RM 0.25 per kilowatt-hour, determine the total energy cost to be paid for a year.  
(4 marks)  
(25 marks)
Q3. (a) Explain the meaning of slip in an AC motor

(b) The stator of a 3-phase, 4-pole induction motor is connected to a 50 Hz supply. The motor runs at 1455 rpm at full load. Determine
i) the synchronous speed

ii) the slip at full load

(c) Give 4 examples of electrical hazard sources that can be found in home or office.

(d) Describe the functions of earthing/grounding in providing safety to user when a life wire touches the metal case of an appliance.

(e) Explain 2 advantages of a circuit breaker compared to a wire fuse.

(f) Describe 3 factors that determine the selection of the size of conductor used for electrical wiring.
SECTION B: MECHANICAL

Q1. (a) Describe the functions of communication pipe, service pipe and distribution pipe in a domestic water supply system. Illustrate your answer with suitable sketches.

(10 marks)

(b) **Figure Q1** (pages 7) shows the plumbing layout of a bungalow. Estimate the maximum flow rate for this residence. If the combined physical length of the service pipe and communication pipe is 8.5 m, what is the total head loss from the mains to the cistern which is located 3.5 m above the mains.

(15 marks)
(25 marks)

Q2. (a) State and explain the main principle of the most commonly installed elevator.

(5 marks)

(b) Sketch a typical escalator installation and explain why is the floor reaction at the upper level greater than the floor reaction at the lower level.

(5 marks)

(c) A superstore escalator could transport a maximum of 80 persons at any instant. It is inclined at 30° to the horizontal. The distribution of passengers on the escalator are 8 persons each on the lower flat and upper flat sections and the remaining passengers stand on the slope. If the escalator moves at 0.5 m/s and the friction between the escalator and its guide rails is negligible, estimate the power require by the escalator.

You may assumed that each step accommodate two passengers and the combine weight per step is 140 Kg.

(15 marks)
(25 marks)
Q3. (a) The Indoor Air Quality Act refers to the quality of air inside a building. Explain five consequences that could arise from poor indoor air quality.

(5 marks)

(b) A classroom measures 25 m by 12 m and 4 m high. It is required that the air in the room be changed every 15 minutes. The room is to be ventilated by four exhaust fans. Suggest suitable exhaust fans for the room. If the pressure drop across an exhaust fan is 6 cm of water, estimate the power required by each fan. Take density of air as 1.2 kg/m³.

(10 marks)

(c) Sketch a diagrammatic layout and explain the operation of a Chilled Water Air Condition System.

(10 marks)

(25 marks)

Q4. (a) Describe four (4) classifications of fire and the appropriate fire fighting media (agent) to extinguish each class of fire.

(10 marks)

(b) An electrical substation is provided with total flooding carbon dioxide (CO₂) fire fighting system. The dimension of the room is 20 m x 20 m x 4 m.

(i) Sketch the installation of the room and indicate all fittings for CO₂ fire fighting system.

(ii) Estimate the quantity of CO₂ in kg for this room.

(iii) If 1 cylinder contains 90 kg of CO₂ gas, estimate the number of CO₂ cylinder.

(15 marks)

(25 marks)
KERTAS SOALAN PEPERIKSAAN TAMAT