Professional Practice Examination

Reprint – December 2017

ASSOCIATION OF PROFESSIONAL ENGINEERS OF ONTARIO

PROFESSIONAL PRACTICE EXAMINATION – December 2, 2017

PART "A" – Professional Practice and Ethics

You will be given a total of **90 minutes** to complete this examination.

Use the correct colour-coded Answer Book for each part, place in the correct envelope and **seal after completed**.

White Answer Book for Part A white question paper.
Coloured Answer Book for Part B coloured question paper.

This is a **"CLOSED BOOK"** examination. **No** aids are permitted other than the excerpts from the 1990 Ontario Regulation 941 covering sections 72 (*Professional Misconduct*) and 77 (*Code of Ethics*) supplied at the examination. Dictionaries are **not** permitted.

The marking of questions will be based not only on academic content, but also on legibility and the ability to express yourself clearly and correctly in the English language. If you have any doubt about the meaning of a question, please state clearly how you have interpreted the question.

All **four** questions constitute a complete paper for Part "A". Each of the four questions is worth 25 marks.

Any similarity in the questions to actual persons or circumstances is coincidental.

WHERE A QUESTION ASKS IF A CERTAIN ACTION BY AN ENGINEER WAS ETHICAL OR NOT, A SIMPLE "YES" OR "NO" ANSWER IS NOT SUFFICIENT. YOU ARE EXPECTED TO COMMENT ON AND DISCUSS THE ACTION OF THE DIFFERENT INDIVIDUALS AND/OR ORGANIZATIONS INVOLVED IN EACH SITUATION.

You should identify where applicable the appropriate clauses in Regulation 941. **SIMPLE REFERENCE TO THE APPROPRIATE CLAUSES WITHOUT A DISCUSSION OF HOW THE CLAUSE APPLIES IN THE SITUATION DESCRIBED IS NOT SUFFICIENT.**

Question 1

(5) (a) The principal objective of PEO is to regulate the practice and govern professional engineering to serve and protect the public interest. The association has additional objectives to pursue under the Act. What is the essence of these additional objectives?

(5) (b) A Temporary Licence holder may hold a Certificate of Authorization. Are there any limitations on the C of A held by the Temporary Licence holder?

(5) (c) Should a P.Eng. place a copy of his/her seal (stamp), signature and date on drawings that he/she releases?

(5) (d) In addition to the Certificate of Authorization, PEO grants four (4) different types of licence related to the practice of professional engineering in Ontario. What are they?

(5) (e) PEO has enforcement as one of its regulating functions. What does the term enforcement mean?

Question 2

Vulcan Radio Manufacturing Inc. ("Vulcan") is a well-known manufacturer of radio broadcast equipment. Vulcan employs Thor on a full-time basis as an engineering sales representative in Ontario.

In addition to working for Vulcan, Thor performs independent professional engineering consulting services for radio broadcasters. Thor's business cards read Thor, Audio Consulting Engineering Services.

Thor's independent services include technical analyses of broadcast systems. As part of these services, Thor often makes recommendations for the selection and purchase of broadcast equipment by broadcasters. Sometimes, Thor recommends Vulcan's equipment to clients.

Using PEO's Codes of Ethics and Professional Misconduct as your guide.

(10) (a) What approvals, licences etc must Thor obtain in order to be legally allowed to provide such consulting professional engineering services?

(10) (b) Assuming that Thor has all the necessary licences, what should Thor tell his regular employer and clients about this work?

(5) (c) Discuss Thor's obligations in recommending Vulcan's equipment to his clients.

Question 3

Mercury is a licensed professional engineer with over 15 years experience in the design of door latching systems for the aircraft industry. He was the senior designer of the door systems for a new line of executive jets his company had recently launched. After the plane went into production, Mercury, using new software that simulated various failure modes, determined that the latching systems might fail under certain circumstances. Design modifications were reviewed and determined to be very expensive.

Mercury's boss, Hera, also a P.Eng., believed that the failure circumstances were incredibly remote and that the design met all the commonly used design and safety criteria. The design was similar to the one used on executive jets for many years without any problems. She was also concerned about the financial viability of the firm if the expensive design changes were made especially with a recall of the already delivered planes. In addition, all regulators had reviewed the design and found no reason to question its safety. Consequently, she directed Mercury to leave the design alone. She also decided that she would not authorize any further review of Mercury's work to determine if there was a problem and she did not inform senior management.

Mercury was very concerned that the design was inadequate and might fail. He had reviewed the results of the simulations many times before bringing the matter to Hera's attention and believed that his analysis was correct. Since no failures of the design had been reported at the time of his review, Mercury accepted Hera's decision and did not pursue the matter further.

Six months after Mercury had brought the potential problem to Hera's attention, a door latch failed during a flight and the plane had to make an emergency landing. Fortunately no one was injured. Hera directed Mercury to be quiet about having raised some concerns about the design since it might have implications with the regulators.

Using PEO's Codes of Ethics and Professional Misconduct as your guide:

(10) (a) Discuss the Mercury's behaviour and actions before the door latch failed including any consequences he might face.

(7) (b) Describe the actions Mercury should now take after the failure.

(8) (c) Discuss Hera's behaviour and actions including any consequences she might face.

Question 4

Beta is a recently licensed professional engineer employed by a medium-sized software development company, Softdisk. Beta, P.Eng. has worked for Softdisk since graduating from university and she has been promoted to the position of software engineer as a result of being licensed. With this promotion has come increased salary and an increased responsibility and workload. At home, Beta is a new parent and is looking to purchase a new house.

Beta is working furiously to meet a deadline for the design of an electrical process computer modelling program. Beta is afraid that she will not meet the deadline and does not want to admit defeat by informing her boss. Beta's spouse, also a professional engineer, has access to design software developed by his company, HardDisk Inc. The software has been used effectively for similar design. Beta's spouse reasons that HardDisk Inc would not mind if he let Beta use this software since they had upgraded to a more current version. With the help of this software Beta expects to be able to meet the deadline.

Using PEO's Codes of Ethics and Professional Misconduct as your guide:

(15) (a) What ethical issues should Beta resolve before using the software? Discuss.

(10) (b) Does Beta's spouse have any ethical obligations to fulfill? Discuss.

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PROFESSIONAL PRACTICE EXAMINATION – December 2, 2017

PART "B" - Engineering Law and Professional Liability

You will be given a total of **90 minutes** to complete this examination.

Use the correct colour-coded Answer Book for each part, place in the correct envelope and seal after completed.

White Answer Book for Part A white question paper.

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The marking of questions will be based not only on academic content, but also on legibility and the ability to express yourself clearly and correctly in the English language. If you have any doubt about the meaning of a question, please state clearly how you have interpreted the question.

All **four** questions constitute a complete paper for Part "B". Each of the four questions is worth 25 marks.

25) 1. Briefly define and explain any five of the following:

(i) The difference between mediation and arbitration
(ii) Employee treatment rights under Human Rights Code (list 5)
(iii) The discoverability concept
(iv) Dispute resolution board
(v) Contra proferentem
(vi) Secret commission
(vii) The New York Convention
(viii) Vicarious liability

25) 2. A newly formed energy company ("NEWCO") decided to investigate the possibility of developing a liquefaction process to convert coal deposits into oil.

NEWCO entered into a contract with a large engineering firm pursuant to which the engineering firm was to carry out a feasibility study to determine, over a period of eight months and by a specified date, the feasibility of the proposed liquefaction process. The contract between NEWCO and the engineering firm expressly provided that should the feasibility study be completed by the "deadline" date specified and should the results of the study indicate that the liquefaction process proposed by the engineering firm would meet the specified quality and volumes of liquefied oil output, then the engineering firm would be authorized to carry out further work to develop the liquefaction process to operate on a commercial basis, all on terms and conditions clearly set out in the contract between NEWCO and the engineering firm.

The engineering firm undertook the feasibility study and, although the results of the feasibility study appeared promising and in compliance with the parameters specified in the contract with NEWCO, the engineering firm found that it would be unable to complete the feasibility study by the date specified. The president of the engineering firm explained to the president of NEWCO that the engineering firm would not be able to fulfil all aspects of the feasibility study as required by the specified date. The president of the engineering firm emphasized that whereas the engineering firm would likely be two weeks late in completing its feasibility study obligations, the results of the feasibility study indicated that the liquefaction process would very likely meet NEWCO's requirements for commercial production as specified.

The president of NEWCO indicated to the president of the engineering firm, verbally, that the time for completion of the feasibility study would be extended. The engineering firm completed the feasibility study within two weeks after the date specified in the contract.

Subsequently, NEWCO took the position that the engineering firm had not completed the feasibility study in time and, accordingly, that NEWCO was not obligated under the wording of the contract to authorize the engineering firm to carry out further work to develop the liquefaction process on a commercial basis. Instead, NEWCO issued a request for proposals from several firms for the development of the liquefaction process to operate on a commercial basis. NEWCO selected another firm that was prepared to undertake the development of the process for a fee substantially lower than the fee that was to have been paid to the original engineering firm had it completed the feasibility study by the date specified in the contract.

Was NEWCO entitled to deny the engineering firm's right to develop the liquefaction process to operate on a commercial basis? Identify the contract law principles that apply, and explain the basis of such principles and how they may apply to the positions taken by NEWCO and by the engineering firm.

25) 3. An owner/developer (the "owner") entered into a contract with an architectural firm (the "architect") for design and contract administration services in connection with the construction of a ten storey commercial office building.

The building was designed to be entirely surrounded by a paved podium concrete deck used for parking and driving, and the design provided for a parking area below the deck. The podium deck was divided by construction joints and expansion joints placed to allow thermal expansion of the concrete as the temperature changed. The land on which the building was located sloped towards a river so the lower parking deck was designed to be partially open to the outside.

The architect engaged a structural engineering firm (the "engineer"), as the architect's subconsultant on the project. The engineering firm, in its agreement with the architect, accepted responsibility for all structural aspects of construction, and also specifically acknowledged responsibility for the design of the paved podium concrete deck and the parking area below.

Upon completion of the design and the tendering process, the owner entered into a contract for the construction of the project with an experienced contractor who had submitted the lowest bid.

Unfortunately, within two years following construction, a significant number of leaks occurred in the podium deck, which resulted in water leaks in the lower parking garage.

The contract specifications had called for a specific rubberized membrane to be installed for the purpose of waterproofing the podium deck. However, during construction, at the suggestion of the roofing subcontractor and without the knowledge of the owner, another asphalt membrane product was substituted for the rubberized membrane product specified. Neither the engineer nor the architect objected to the substitution when it was suggested.

The roofing subcontractor had suggested the substitute membrane because it was more readily available and would speed completion of construction. The design engineer and the architect took the position that they would rely on the subcontractor's recommendation.

During the investigation into the cause of the leaks, another structural engineering firm provided its opinion that the rubberized membrane as specified in the contract was a superior product to the substituted membrane; that the substituted membrane was brittle and could fracture or crack under certain circumstances, particularly on podium decks with expansion joints; that the winter temperatures had contributed to the breakdown of the substitute membrane as it became more brittle at colder temperatures; and that the substitute membrane should not have been used over expansion joints on a dynamic surface podium deck. The second engineering firm also expressed the opinion that the designers ought to have taken into account the non-static nature of the deck that featured these expansion joints and should not have accepted the substitute membrane.

Ultimately, to remedy the leaks, the substitute membrane had to be replaced by the rubberized membrane originally specified in the contract.

What potential liabilities in tort law arise in this case? In your answer, explain what principles of tort law are relevant and how each applies to the case.

25) 4. An Ontario municipality (the "Owner") decided to build a new "green" hospital that would implement environmentally focused, "green" practices in a broad number of areas including food, water use, waste handling, alternate energy, green building design, energy efficiency, and transportation in and around the hospital. To do so, the Owner had its prime consultant on the project prepare detailed drawings and specifications and invited competitive tenders from contractors for the construction of the new facility.

The Owner's prime consultant on the project prepared the Tender Documents to be given to contractors interested in bidding on the project. Each of the bidders was required to be prequalified and approved by the Owner for participation in the bidding. The Tender Documents included the Plans and Specifications, the Tendering instructions which described the tendering procedure and other requirements to be followed by the bidders, the Tender Form to be completed by the bidders, the form of written Contract that the successful contractor would be required to sign after being awarded the contract, and a number of other documents.

According to the Tendering Instructions, each tender bid as submitted was to remain "firm and irrevocable and open for acceptance by the Owner for a period of 90 days following the last day for submitting tenders". The Tendering Instructions also provided that all bids were to be submitted in accordance with the instructions in the Owner's Tender Documents and that the Owner was not obligated to accept the lowest or any tender.

Tenders were submitted by five of the six bidders. All bids were submitted in accordance with the Owner's Tender Documents. The lowest bid was well within the Owner's budget.

Within the 90 days specified and before the Owner's prime consultant had made a recommendation to the Owner as to whom the contract should be awarded, the prime consultant received a telephone call from a member of the Municipal Council who noted that the lowest bidder was not one of the bidders who were "local bidders" from within the Municipality. A meeting was subsequently convened between the prime consultant and the Municipal Council at which several Council members joined forces in strongly expressing their view that the contract should in fact be awarded to a local bidder. One of the Councillors emphasized that if one item that had been included in the specifications was deleted from the bids the result would be that the bid of the lowest "local contractor" would become the lowest bid overall and the Councillors' preference for awarding the contract to a "local contractor" could be satisfied.

There had been no reference in the Tendering Instructions to any preference being shown to local contractors.

How should the prime consultant deal with the political pressure being applied by the Council members?

If the contract is awarded to the lowest local bidder what potential liabilities in contract law may arise? If the prime consultant recommends to the Owner that the contract be awarded as the Councillors suggest what liabilities may arise for the prime consultant? Please provide your reasons and analysis.