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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019**

COURSE NAME : PHYSICS OF RADIOTHERAPY AND
NUCLEAR MEDICINE

COURSE CODE : BWC 40903

PROGRAMME CODE : BWC

EXAMINATION DATE : DECEMBER 2018/ JANUARY 2019

DURATION : 3 HOURS

INSTRUCTION : ANSWER **ALL** QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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- Q1** (a) Dose-response curve describes the change in effect on an organism by differing levels of exposure to a stressor after a certain exposure of time.
- (i) Define the word stressor in the text above. (2 marks)
 - (ii) Describe **TWO (2)** factors that influence dose-response curve. (4 marks)
 - (iii) Give **TWO (2)** reasons why linear dose-response curve is unsuitable for non-linear situations. (4 marks)
- (b) Synchrotrons and Cyclotrons is a particle accelerator that commonly used for external beam radiation treatments for cancer patients.
- (i) Outline the working principle of synchrotrons. (6 marks)
 - (ii) Elaborate **TWO (2)** important parameters should be considered when treating patients using cyclotrons. (4 marks)
- Q2** (a) Shaping the beam is an important way to minimized the absorbed dose in healthy tissue and critical structures during radiation treatment.
- (i) Specify **FOUR (4)** types of field shape that are used in radiotherapy.
 - (ii) Clarify how beam shaping could affect patient's surface countour. (10 marks)
- (b) Briefly explain the pre and post treatment during radiation planning procedures. (5 marks)
- (c) A patient is simulated to receive a treatment to cover a tumor volume at 1 cm on each side. The width and depth of the tumor is 3.5 cm and 4.0 cm respectively. Illustrate an appropriate field width at the skin surface using a linear accelerator with the isocentric setup. (5 marks)

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- Q3** (a) The purpose of radiation safety interlock system (RSIS) is to prevent injury, death, or serious overexposure from high radiation levels. Propose tolerance information that might be introduced to RSIS for Cobalt-60 units and medical accelerator. (8 marks)
- (b) Briefly explain the federal guidelines for position indicating device (PID) test. (6 marks)
- (c) Suggest and explain **THREE (3)** precautions steps must be taken in removing the X-ray film from the cassette. (6 marks)
- Q4** (a) The radiation sources used for brachytherapy can be delivered manually or using a technique that known as afterloading.
- (i) Distinguish between manual and remote afterloading. (4 marks)
- (ii) Provide **THREE (3)** emergency policies for radioactive sources handling using remote afterloaders. (6 marks)
- (b) Catheters are medical devices that can be inserted into the body to treat diseases or perform a surgical procedure.
- (i) Describe in details the potential complications in urethral catheterization procedure. (5 marks)
- (ii) Clarify briefly how catheter blockage can occur. (5 marks)

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- Q5** (a) Mrs. Courtney suffered from motor neurone disease that left her paralysed from the neck down. She need of 24-hour care. Unable to end her own life, she wanted her husband to help her die without being prosecuted. Based on this case study
- (i) Recommend a medical ethics based on the voluntary euthanasia principle. (5 marks)
 - (ii) Describe why euthanasia can be a controversial issue in medical ethics. (5 marks)
- (b) In 2000, Alexandra was diagnosed with Kennedy's disease and was worried her last days would be racked by pain. Her greatest fear was the prospect of suffocating or choking to death when breathing and swallowing. With only weeks to live, she asked the High Court to rule that if this happened, her doctor could intervene and administer diamorphine to her even if it might shorten her life. Based on this case study
- (i) Isn't euthanasia or assisted suicide sometimes the only way to relieve excruciating pain. Justify your answer. (5 marks)
 - (ii) Since euthanasia or assisted suicide is not against the law, why should it be illegal to help someone commit suicide? Justify your answer. (5 marks)

-END OF QUESTIONS -

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