**ROYAL CIVIL SERVICE COMMISSION**

**BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2014**

**EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALIZATION PAPER for *ORTHOTICS AND PROSTHETICS***

**Date** : 12 October 2014

**Total** **Marks** : 100

**Examination** **Time** : 150 minutes (2.5 hours)

**Reading** **Time** : 15 Minutes (prior to examination time)

**GENERAL INSTRUCTIONS**

1. Write your Roll Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO** **SECTIONS**, namely SECTION A and SECTION B

* **SECTION** **A** has two parts: Part I – 30 Multiple-Choice Questions

Part II – 4 Short Answer Questions

All questions under SECTION A are COMPULSORY.

* **SECTION** **B** consists of two Case Studies. Choose only ONE Case study and answer the questions under your choice.

1. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating any or correct Section, Part, and Question Number will NOT be evaluated and no marks would be awarded.
2. Begin each Section and Part in a fresh page of the Answer Booklet.
3. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
4. Use of any other paper including paper for rough work is not permitted.
5. You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.
6. This paper has 09 printed pages in all, including this instruction page.

**Good Luck!**

**SECTION A**

**PART I – Multiple Choice Questions (30 Marks)**

**Choose the most correct answer and write down the letter of the correct answer chosen in the Answer Booklet against the number, e.g. 31(c). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice will not be evaluated.**

1. ASH brace is a spinal orthosis that prevent
   1. Flexion of the spine
   2. Extension of the spine
   3. Side flexion of the spine
   4. Rotation of the spine
2. Mr. Needup has medio-lateral instability at the ankle joint. Which type of orthotic ankle joint can be prescribed?
3. plantar flexion stop
4. Dorsiflexion assist
5. Free motion
6. Fixed
7. Anterior cruciate ligament of the knee joint prevent
   1. Anterior displacement of tibia during knee flexion
   2. Anterior displacement of tibia during knee extension
   3. Posterior displacement of tibia during knee flexion
   4. Posterior displacement of tibia during knee extension
8. Valgus strap is attached on
9. Lateral aspect of the shoe and buckled on medial upright
10. Anterior to the shoe and buckled on lateral upright
11. Lateral aspect of the shoe and buckled on lateral upright
12. Medial aspect of the shoe and buckled on lateral upright
13. Which of the following is an indication of Supra Malleolar Orthosis (SMO)?
14. Moderate to severe subtalar instability
15. Flexible arch instability
16. Flexible equinus deformity
17. Mild to moderate subtalar instability
18. Turn-buckle cock-up splint is prescribed in which of the following cases?
19. Radial nerve palsy
20. Ulnar deviation
21. Radial deviation
22. None of the above
23. In an articulated AFO the ankle joint is placed on
24. Distal tip of lateral malleolus
25. Distal tip of medial malleolus
26. Mid- point of lateral or medial malleoli
27. Subtalar joint
28. A 5 year old child has equinus deformity. What shoe modification will you do?
29. Raise the heel part of the shoe
30. Remove the heel part from the shoe
31. Raise the outer border of the shoe
32. Raise the inner border of the shoe
33. ‘Holding a key is’ which type of prehension?
34. Spherical prehension
35. Palmar prehension
36. Lateral prehension
37. Tip to tip prehension
38. Which type of orthosis would you prescribe in case of flail knee, flail ankle and invertors are stronger than evertors?
39. HKAFO with lateral T strap
40. KAFO with lock and free motion ankle joint and lateral T strap
41. KAFO with drop lock knee joint, limited motion ankle joint and lateral T strap
42. KAFO with drop lock knee joint, limited motion ankle joint and medial T strap
43. Mr. Jigme has been using KAFO with drop lock knee joint for last 3 months, but now he is experiencing difficulty in locking and unlocking the knee joint since he cannot bend his trunk forward. Which type of joint will you prescribe him for easy locking and unlocking?
    1. Drop ring lock
    2. Cam lock
    3. Free knee joint
    4. None of the above
44. In which cases will you NOT prescribe offset knee joint?
45. Knee hyperextension
46. Knee and hip flexion contracture
47. Both a and b
48. None of the above
49. Two years old child with CTEV has flexible equinus and varus deformity at the ankle joint. What shoe modification would you do?
50. Raise the heel part and medial border of the shoe
51. Remove the heel part and provide lateral heel and sole wedge
52. Raise the heel and provide lateral heel and sole wedge
53. None of the above
54. Location of mechanical knee joint is
55. 19 mm above from the medial tibial plateau
56. Between adductor tubercle and tibial plateau
57. 15 mm above from the tibial plateau
58. Both a and b
59. FRO is prescribed when the power of quadriceps is
60. 2 to 3+
61. 3 to 3 +
62. 2+ to 3
63. 3 to 3-
64. The highest point of medial arch is located between
65. Sustentaculumtali and Talonavicular joint
66. Talo-crural and subtalar joints
67. Talo-crural and calcaneocuboid joints
68. Intermetatarsal and interphalangeal joints
69. What are the effects of an orthosis set in 5 degree dorsiflexion?
70. Increases knee flexion moment
71. Increases instability in early stance phase
72. Greater toe clearance in swing
73. All of the above
74. The statement below is true about the Muenster Socket EXCEPT
    1. Anteriorly the trim line extends to the level of the anti-cubital fold with a channel for the bicep tendon
    2. Provides excellent stump socket, stability and considerable lifting force
    3. It allows elbow flexion more than 60 to 70 degrees
    4. Posteriorly trim line hooks over the olecranon
75. The Blount’s disease refers to
    1. Lateral bowing of tibia in children
    2. Lateral bowing of legs at the knee
    3. Genu-valgum of the knee
    4. Lateral displacement of the knee
76. The wrist unit is designed to facilitate rapid interchange of different terminal device by manually positioning the terminal device in supination and pronation and lock the terminal device in desired degree of supination and pronation. Which one of the following wrist unit is true about the above statement?
    1. Friction wrist unit
    2. Quick change wrist unit
    3. Wrist flexion unit
    4. Constant friction wrist unit
77. Which of the following level of amputation has a bad reputation, because the stump tends to be pulled into equinus by the imbalanced pull of the Achilles tendon?
    1. Lisfranc amputation
    2. Pyrogoff amputation
    3. Chopart amputation
    4. Trans-metatarsal amputation
78. For the Trans-humeral and Trans-radial amputee, the mechanical efficiency will be enhanced if the cross point or ‘O’ ring is located
    1. Towards the amputated side
    2. Below the spinous process of C7 and slightly towards the non amputed side
    3. Above spinous process of C7 and slightly towards the non-amputated side
    4. Between spinous process of C7 and superior angle of scapula
79. Fusion of a joint to prevent motion is termed as
    1. Arthrodesis
    2. Osteotomy
    3. Arthroplasty
    4. Arthrotomy

1. Internal rotation of knee joint for Trans femoral prosthesis will lead to
   1. Medial whip
   2. Lateral whip
   3. Vaulting
   4. Circumduction
2. A 32 year old woman with a trans-tibial prosthesis is seen to have knee buckling during terminal stance. What prosthetic modification would correct this problem
   1. Slightly planter flex the prosthetic foot
   2. Move the toe break of the prosthesis more posterior
   3. Increase flexibility or softness of the keel
   4. Move foot anteriorly
3. Which one of the following angle is true about the angle between the neck and shaft of the femur in adult?
   1. 140-150 degree
   2. 130-140 degree
   3. 120-130 degree
   4. 110-120 degree
4. All of the following biomechanical statement is true for Trans-femoral amputee with quadrilateral socket during heel strike to achieve knee stability EXCEPT
   1. Ground Reaction force passes anterior to weight transfer force
   2. The forces results in clockwise rotation of the prosthesis around the residual limb
   3. There are pressure on posterior distal and anterior proximal
   4. By active use of hip extensors the amputee can cause reaction force to pass anterior to knee
5. The abducted gait deviation will be observed during
   1. The period of double support
   2. Mid-stance
   3. Heel strike
   4. Foot flat
6. Location of the Ischial set for Trans femoral amputee with quadrilateral socket design is at
   1. 1 inch lateral and ½ inch posterior from medio-posterior corner
   2. ½ inch lateral and 1 inch posterior from medio- posterior corner
   3. 1 inch medially and ½ inch posterior from posterior-lateral corner
   4. ½ inch posterior and 1 inch medially from posterior-lateral corner
7. Which of the following statements is true about the medial thrust?
   1. Foot is set into varus position in relation to pylon and socket
   2. Pressure is on lateral proximal and medial distal aspect of the socket and residual limb
   3. There is relative displacement of the foot towards the midline
   4. Pressure is on proximal medial and lateral distal aspect of the socket and residual limb

**PART II – Short Answer Questions (20 marks)**

**Answer ALL the questions. Each question carries 5 marks.**

1***.*** Define Axis and Plane? Describe the movements of human body with respect to Axis and plane?

2. List the biomechanical principles of socket design?

3. List the function of spinal orthosis, positive and negative biomechanical effect of spinal orthosis?

4. Mention the elements of standard Above Elbow (AE) and Below Elbow (BE) harness and write a short note of it?

**SECTION B (50 marks)**

**CASE STUDY**

***Choose either Case 1 or Case 2 from this Section. Each case carries 50 Marks. Mark for each sub-question is indicated in the brackets.***

**CASE 1**

Mr. Dorji is a 38 year old male with a recent right Trans-tibial amputation. Though the general Manual Muscle Testing (MMT) and shape of the residual limb are good, he has got 7 degree of knee flexion contracture and adherent scar on the anterior aspect of the distal third of the residual limb due to poor post-operative and pre-prosthetic management. He also presents with mild medio-lateral ligament laxity at the knee joint.

Now he is depressed, confused and worried that he may not be able to continue his teaching profession due to impairment. At the moment, his acceptance of prosthetic rehabilitation is narrowed with strong negative believe and concern of social stigma, cosmesis and lack of hope in regaining functional activities.

**Answer all questions** (50 marks)

1. What degree of knee flexion will you maintain and follow the casting procedure? (1 mark)
2. What type of prosthesis will you design and fabricate, and why? (3 marks)
3. List the indications, contra-indications, advantages and disadvantages of your socket design for Mr. Dorji? (8 marks)
4. Name and describe the tests you may perform to check Medio-lateral instability at the knee? (2 marks)
5. Mention the position or placement of axis, fixed bar and moveable bar of the goniometer when measuring the Knee ROM? (3 marks)
6. Define Neuroma, Phantom limb pain, and Phantom limb sensation (3 marks)
7. Mention 5 indications for amputation. (5marks)
8. Mr. Dorji is confused. How can you help him understand and agree to the prosthetic Rehabilitation? (3 marks)
9. Mention 5 characteristics of an ideal stump. (5 marks)
10. What level is the common site for amputation? What is the percentage of energy cost with unilateral below knee amputation? (1 mark)
11. Above knee residual limb always tend to go into flexion and abduction deformity. Explain briefly the patho-mechanics (muscle work) of this deformity. How will you prevent this deformity? (3 marks)
12. Describe in brief about the comprehensive post-operative and pre-prosthetic management program for Mr. Dorji (5 marks)
13. Explain in brief about the Lateral thrust of the knee? (3 marks)
14. Explain about the bench alignment of standard Trans-femoral and Trans-tibial prosthesis? (5 marks)

**CASE 2**

A child is referred to you with CTEV bilaterally with right hip dislocation. Baby was delivered 3 months ago in a basic health unit (BHU) located in her community. Mother states that her baby did not have any problems after the birth, since health workers in the BHU did not indicate the problem. She came to know about the current problem of her baby when the pediatrician she consulted for pneumonia, sent her baby for screening at children physiotherapy.

**Answer All Questions (50 marks)**

1. Expand CTEV. (1 mark)
2. What is developmental dysplasia (DDH)? From which day after birth will you check for DDH? (2 marks)
3. Name and describe the special tests that physiotherapist might perform on a child to determine DDH. (7 marks)
4. How will you ensure that the pelvis is squared for limb length measurement? (1 mark)
5. How will you measure True and Apparent limb length? (2 marks)
6. Mention at least 5 Orthoses or Casts to treat hip dislocation in a child. (5 marks)
7. Name an Orthosis to treat genu-varum and genu-valgum. (1 mark)
8. Mention 5 features of a CTEV shoe. (5 marks)
9. List the structure contracted in all 3 sides (Rule of 3, 2 and 1) for CTEV. (7 marks)
10. Mention arches of the foot and bones responsible for forming them. (5 marks)
11. List and describe 3 clinical tests that you may perform to determine club foot for new born baby? (4 marks)
12. Describe management of CTEV. (5marks)
13. Write down the biomechanics of a solid AFO? (5 marks)