

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2012
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALIZATION PAPER for MECHANICAL ENGINEERING

Date	: 14 October 2012
Total Marks	: 100
Examination Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

1. Write your Roll Number clearly on the Answer Booklet in the space provided.
2. The first 15 minutes is being provided to check the number of pages, printing errors, clarify doubts and to read the instructions. You are NOT PERMITTED TO WRITE during this time.
3. Use either Blue or Black ink pen or ball point pen for the written part and Pencils for the sketches and drawings.
4. All answers should be written on the Answer Booklet provided. Candidates are not allowed to write anything on the question paper or any other materials.
5. It is divided into two sections-namely SECTION A and SECTION B.
6. SECTION A consists of two parts: Part I and Part II.

Part I consists of 30 Multiple-Choice Questions carrying one (1) mark each and is compulsory. The answer of your choice should be clearly written in whole along with the question and option number on your answer booklet. Eg. 31(c).

Part II consists of four (4) short answer questions of five (5) marks each and all questions are compulsory. Mark for each sub-question is indicated in the brackets.

7. SECTION B consists of two Case Studies. Choose only ONE case study and answer the questions under your choice. Each case study carries fifty (50) marks in total. Mark for each sub-question is indicated in the brackets.
8. This Paper consists of TEN (10) pages including this Instruction page.

SECTION A (50 Marks)

Answer all questions.

I. Multiple Choice Questions (30 Marks).

Each question carries 1 (one) mark. Write the question number followed by answer of your choice on the answer sheet.

1. A bolt of M24 x 2 means
 - a. The pitch of the thread is 24mm and depth is 2mm
 - b. Cross-sectional area of the thread is 24mm^2
 - c. Nominal diameter of the bolt is 24mm and the pitch is 2mm
 - d. The effective diameter of the bolt is 24mm and there are 2 threads per cm

2. Hooke's law holds good up to
 - a. Yield point
 - b. Elastic limit
 - c. Plastic limit
 - d. Breaking point

3. The castings produced by forcing molten metal under pressure into a permanent metal mould is known as
 - a. Permanent mould casting
 - b. Slush casting
 - c. Die casting
 - d. Centrifugal casting

4. _____ is considered as the "Father of Engineering Economics".
 - a. O.B Goldman
 - b. J.C.L Fish
 - c. Arthur M. Wellington

- d. Eugene L. Grant
5. An electromechanical energy convertor that converts chemical energy of fuel directly into DC electricity is called
- Fuel Cell
 - Fuel Generator
 - Combustion Engine
 - DC Generator
6. According to Indian standard specification, 100 H6/g5 refer to
- Tolerance grade of 6 for the hole and 5 for the shaft
 - Tolerance grade of 6 for the shaft and 5 for the hole
 - Tolerance grade of 11 for the hole
 - Tolerance grade of 11 for the shaft
7. The modulus of elasticity for mild steel is approximately equal to
- $0.1 \times 10^6 \text{ kgf/cm}^2$
 - $0.8 \times 10^6 \text{ kgf/cm}^2$
 - $1.1 \times 10^6 \text{ kgf/cm}^2$
 - $2.1 \times 10^6 \text{ kgf/cm}^2$
8. In case of a multiple disc clutch, if n_1 are the number of discs on the driving shaft and n_2 are the number of discs on the driven shaft, the number of pairs of contact surfaces will be
- $n_1 + n_2$
 - $n_1 - n_2$
 - $n_1 + n_2 - 1$
 - $n_1 + n_2 + 1$
9. Due to the centrifugal force acting on the rim, the flywheel arms will be subjected to
- Tensile stress
 - Compressive stress

- c. Shear stress
 - d. Torsion stress
10. A brake commonly used in motor cars is
- a. Shoe brake
 - b. Band brake
 - c. Band and block brake
 - d. Internal expanding brake
11. The size of the gear is usually specified by
- a. Pressure angle
 - b. Pitch circle diameter
 - c. Circular pitch
 - d. Tooth thickness
12. Steel containing up to 0.15% carbon is known as
- a. Mild steel
 - b. Dead mild steel
 - c. Medium carbon steel
 - d. High carbon steel
13. Steel widely used for motor car crankshaft is
- a. Nickel-chrome steel
 - b. Chrome steel
 - c. Silicon steel
 - d. Nickel steel
14. The maximum bending stress in a curved beam having symmetrical section always occur at the
- a. Centroidal axis
 - b. Neutral axis
 - c. Inside fibre

- d. Outside fibre
15. Rankine's theory is used for
- a. Brittle materials
 - b. Ductile materials
 - c. Elastic materials
 - d. Plastic materials
16. The design of pressure vessel is based on
- a. Longitudinal stress
 - b. Hoop stress
 - c. Tangential stress
 - d. Torsional stress
17. Which of the following joints is commonly used for pipes carrying water at low pressure
- a. Union joint
 - b. Spigot joint and socket
 - c. Nipple joint
 - d. Socket or a coupler joint
18. A leaf spring is used in automobiles to
- a. Apply forces
 - b. Measure forces
 - c. Store strain energy
 - d. Absorb shocks
19. A key made from cylindrical disc having segmental cross-section is known as
- a. Tangential key
 - b. Woodruff key
 - c. Feather key
 - d. Flat saddle key

