



Name: _____

Teacher: _____ Mrs Mani

Girraween High School

**2015
Half Yearly
HIGHER SCHOOL CERTIFICATE
PRELIMINARY EXAMINATION**

Engineering Studies

General Instructions

- Reading time – 5 minutes
- Working time – 60min
- Write using black or blue pen
- Drawings may be done in pencil
- Write your name at the top of every page
- Formulae are provided on the front page
- Where possible support your answers with relevant sketches
- Untidy answers may not gain full Marks
- Where possible show full working

Formulae which may be used in this test:

- $F = ma$
- $W = mg$

Total marks – 70 marks

Section 1 – Pages 3 - 7

Total marks (20)

Attempt questions 1- 20

Allow about 15 minutes for this section

Section II Pages 8 – 14

Total marks (50)

Attempt questions 21 –24

Allow about 45 minutes for this section

STUDENT NUMBER/NAME:

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Section I**Total marks (20)****Attempt Questions 1 – 20****Allow about 25 minutes for this section**

Select the alternative A, B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid **in the separate page provided at the back of the examination that you can tear off.**

1. What is the SI symbol and name used to denote an order of magnitude of 10^{-6} ?
 - (A) M, mega
 - (B) μ , micro
 - (C) p, pico
 - (D) m, milli

2. What does SI mean?
 - (A) Systeme incorporated
 - (B) Systeme international
 - (C) Standard incorporated
 - (D) Similarly international

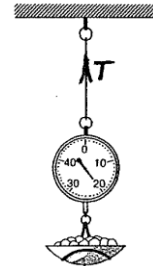
3. Atoms form 3 primary bonds, they are;
 - (A) Metallic, liquids and covalent
 - (B) Ionic, metallic and electrons
 - (C) Ionic, covalent and metallic
 - (D) Covalent, metallic and electrons

4. Condensation polymerisation occurs when:
 - (A) monomers in plastic are squashed together by force and heat
 - (B) polymer molecules are long-chain and linear molecules, without cross-linking, as the result of monomers combining together
 - (C) monomers link together with secondary bonds and a by-product such as water vapour may be given off
 - (D) when the formation of thermo-softening polymers is reversed so that the polymer cannot be melted

5. Which statement describes a reason why the handles of metal saucepans and cooking ware are generally made from thermosetting polymers?
- (A) Thermosetting polymer handles are more durable and easier to form than metal handles.
 - (B) Thermosetting polymers have a higher resistance to heat due to having an ionic bonded two dimensional linear structure.
 - (C) Handles made from thermosetting polymers are easier to form and more aesthetically pleasing than thermosoftening polymers.
 - (D) Thermosetting polymers have a higher resistance to heat because of a covalently bonded three-dimensional network structure.
6. Which of the following is a *vector* quantity?
- (A) Mass 22.8kg
 - (B) Force 67N vertically down
 - (C) Time 30s
 - (D) Velocity 110km/h
7. Which of the following best describes a *composite* material?
- (A) The horizontal and vertical parts of a vector
 - (B) Proportions of metal in an alloy
 - (C) A mixture of two materials possessing properties different from the original
 - (D) Two or more materials mixed together in fixed proportions by weight
8. Which 3 are methods of permanently joining metals together?
- (A) Soldering, welding and joining
 - (B) Milling , soldering and brazing
 - (C) Welding, brazing and soldering
 - (D) Soldering, extrusion and brazing

9. The conditions necessary for a body to be moving at constant velocity are:
- (A) The sum of all vertical forces acting on the body is zero
 - (B) The sum of all horizontal forces acting on the body is zero
 - (C) The sum of all moments acting on the body is zero
 - (D) All of the above

10. The spring balance in the diagram has a mass of 2 kg and is showing a reading of 20kg.
The tension in the cable supporting the balance is:
- (A) 220N
 - (B) 200N
 - (C) 22N
 - (D) 40N



11. Which of the following best describes Thermosetting Polymers?
- (A) Polymers that can be softened repeatedly such as Bakelite
 - (B) Polymers that are composed of long chains with minimal cross-linking
 - (C) Polymers that are easily Blow moulded
 - (D) Polymers that are chiefly formed through Condensation Polymerisation
12. Ceramics are good thermal and electrical insulators because:
- (A) they have low ductility
 - (B) they are typically hard and brittle
 - (C) they have no conducting electrons
 - (D) they are inorganic non-metallic materials
13. Slip casting is best described as a process which
- (A) casts iron into ingots using a sand-based mould
 - (B) a polymer resin is used to form fibreglass matting onto a mould.
 - (C) has a clay slurry line the walls of a hollow mould that is later broken apart freeing the thin-walled clay shape created by the dried slurry.
 - (D) has a wax shape covered in a clay mould. A molten metal is then poured

In to the mould and displaces the melted wax.

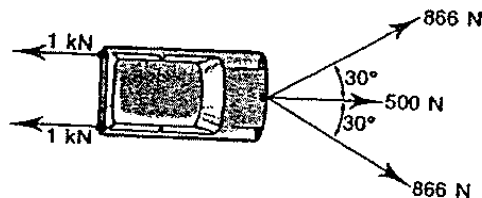
14. Which of the following best describes all the standard headings in an engineering report? (The headings are not in any particular order)

- (A) Summary, Introduction, Experimental procedure, Results and Discussion, Conclusion and Recommendations, Appendix
- (B) Summary, Theory and Analysis, Results and Discussion, Conclusion and Recommendations, Biographic Synopsis and Literature cited.
- (C) Conclusion and Recommendations, Results and Discussion, Experimental Procedures, Theory/Analysis, Introduction and Abstract.
- (D) Results and Discussion, Experimental Procedures, Conclusion and Recommendation, Abstract, Theory and Analysis, Introduction, Acknowledgements, Appendix and Literature cited.

15. A person pushes a table with a force of 700N at an angle of 30° to the horizontal. What is the horizontal force?

- (A) 350N
- (B) 606.2N
- (C) 494.9N
- (D) 595.6N

16. The Car shown in the diagram below is held in a bog by forces of 1kN on each side. Three ropes are attached to the car and forces as shown are applied to the ropes. Will these forces remove the car from the bog? Select the answer that most closely approximates the result.



- (A) Yes, Only just moves the car
- (B) No
- (C) Yes, comfortably moves the car
- (D) Only just misses out on moving the car

17. Which of the lists below are NOT essential skills of the professional engineer?
- (A) Design skills, communication skills, Project Management Skills
 - (B) Process sequencing skills, Verbal communication skills, Mathematical modelling skills
 - (C) Graphical communication skills, Design skills, problems solving skills
 - (D) None of the above.
18. The ability of a metal to be hammered or rolled into thin sheets is described as it's:
- (A) Toughness
 - (B) Stiffness
 - (C) Malleability
 - (D) Ductility
19. Which of the following is NOT true about Electric Induction Motors?
- (A) They are efficient and of durable construction due to lack of brushes.
 - (B) They rely on Lorentz and Faraday's laws for their operation.
 - (C) The stator induces an electric current in the rotor
 - (D) The rotor induces an electric current in the stator.
20. The principle of transmissibility of forces states that:
- (A) A force can act at any point along its line of action
 - (B) Force vectors may be added head to tail to produce a resultant
 - (C) An object will move with constant velocity or remain stationary unless acted on by a resultant force.
 - (D) Forces cannot be transmitted in a vacuum.

End of Section 1

Section II

Total marks (20)

Attempt Questions 21 – 30

Answer the questions in the spaces provided.

Question 21 – Engineering Fundamentals (15 marks)

Marks

(a) Name one Appliance that you have studied

(i) Describe how the introduction of THREE new materials have improved the design of the appliance over the course of its historical development

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Question 21 continues on the next page

- (ii) *'Engineers build structures and systems that improve people's lives'*.
Outline the part played by the recycling and re-use of engineered products in fulfilling the statement quoted above. Use at least one current example to prove your point.

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- (b) Casting, rolling, extruding and fabricating are four important materials forming processes used by the engineer.
Select THREE of these processes. Choose a separate material for each process and then describe how that material would be formed by the relevant process.

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End of Question 21

Question 22 – Materials (8 marks)**Marks**

- a) List two ways in which older washing machines used different materials in their construction that their more modern counterparts.

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- b) The following table is incorrect, use arrows to link the correct definition with the correct bonding.

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Ionic Compounds		Non conductors, high to low hardness values and melting points.
Covalent Compounds		Good conductors, high to low hardness and melting point.
Metallic Bonded materials		Non-conductors in the solid state, conductors in the liquid state and have high hardness and melting points.

- c) Is the following statement true or false? “Glass is a ceramic product of fusion which is cooled to a rigid and solid state without crystallisation occurring”.

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- d) Ceramics can be found in the electrical parts of many household appliances. Where are they most likely to be found, and what properties make them most suitable for that purpose?

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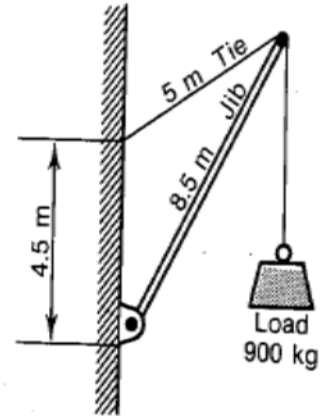
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End of Question 22

Question 23 – Mechanics and Simple Machines (12 marks)**Marks****6**

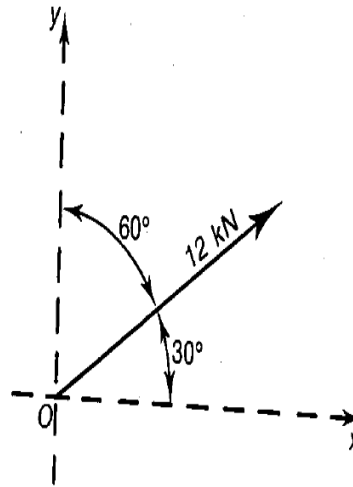
- (a) Determine the forces in the jib crane shown.



Question 23 continues on the next page

Marks

(b) What are the components of the 12kN force in directions Ox and Oy?

6**End of Question 23**

Question 24 – Scope & Communication (15 marks)

Marks

(a) Give a brief general overview of the role of an engineer.

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(b) Name three different fields of engineering and describe their distinctive roles in each particular field.

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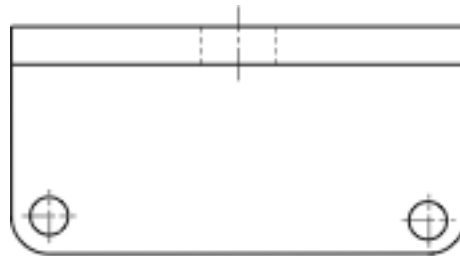
Question 24 continues on the next page

Marks

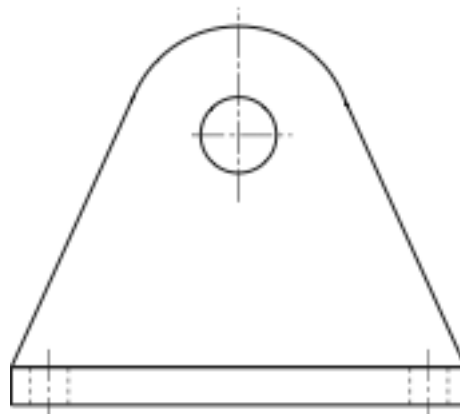
(c) A stainless steel bracket is shown in orthogonal projection.

Draw a *freehand pictorial sketch* of the bracket so that all detail can be seen.

Take sizes directly off the orthogonal drawing.

4

TOP VIEW



FRONT VIEW



RIGHT SIDE VIEW

STUDENT NUMBER/NAME:

END OF EXAMINATION

STUDENT NUMBER/NAME:

Name : _____

Multiple Choice Answer Sheet

Put a neat cross in each question. Only mark one cross for each question.

Question	A	B	C	D
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