THE INSTITUTION OF ENGINEERS, SRI LANKA

PART I EXAMINATION – NOVEMBER 2010

102 – PRESENTATION OF ENGINEERING INFORMATION – PAPER I

Time Allowed : Three (03) Hours

BEFORE ATTEMPTING THE QUESTION PAPER, READ THE INSTRUCTIONS GIVEN BELOW AND ADHERE TO THESE INSTRUCTIONS.

- This question paper has three sections, SECTION A, SECTION B and SECTION C. Answer only **five (05)** questions selecting **at least one (01)** question from each section.

- All questions carry equal marks.

- **The candidates should answer the question/s in each section on a different answer book and the front page of the answer book should have the section identification.**

- Candidates should make **neat, clear, free hand sketches** when answering questions in Section A. Where applicable, the candidates should clearly show the details of **geometrical constructions and methods of projections** and should draw such drawings to scales. In case of mechanical systems or products, show **the details of principles of operations of any mechanisms, and their associated components and assemblies.** Assume any missing dimensions.

- Start answering each question on a new page and write the relevant question number appropriately on the answer book.

- **It is extremely important** that you write the question number to which you answer appropriately in the cage appearing on the cover page.

- Strike out any rough work and contents that you do not wish to draw the attention of the examiner.

- **Marks will be deducted if the above instructions are not adhered to.**

(1)

SECTION A

QUESTION 01

Fig. Q1 shows a pictorial view of a solid object. Produce the following views to a scale of full size in the first angle projection.

(a)   Sectional Front Elevation taken on plane X - X.

(b)   End Elevation projected to the right of view (a).

(c)   Plan projected from view (a).

QUESTION 02

Fig. Q2 shows incomplete orthographic views that resulted from intersection of a cone and a cylinder with their axes intersecting each other. Complete the plan and front elevation.

QUESTION 03

(i)   Fig. Q3 shows projections a_1b_1 and a_2b_2 of a line AB on the vertical and horizontal planes respectively. With a simple geometrical construction, determine the following.

(a)   True length of AB.

(b)   Inclination of AB to the horizontal plane.

(c)   Inclination of AB to the vertical plane.

(ii)   Make sketches of the following items, so that the selected views and method of projections in each case best demonstrate the working mechanism, components and special features, associated with the relevant item.

(a)   Simple Hand Operated Fly Press

(b)   Bench Vice

(2)

QUESTION 04

(a) (i) State De Morgan's theorem for three Boolean variables A, B and C.

(ii) Define the following 2-input device.

  (a) OR gate
  (b) NAND gate
  (c) Exclusive NOR gate

(iii)Realize an Exclusive OR gate using only NAND gates.

(b) A, B, C, D are four inputs of a circuit, representing binary values from 0000 to 1111 (i.e. 0 to 15). The input A is MSB and the input D is LSB. The output of the circuit (F) is **true**, if the input is divisible by 2, 3, 5 or 7 with the exception of 15, otherwise the output is **false.** Assume that zero is not divisible by any number.

  (i) Write the Boolean expression for the output (F) and simplify it using Karnaugh map. Show the steps very clearly.

  (ii) Design a circuit using logic gates (OR, AND and NOT) to perform the same function.

QUESTION 05

Five soldiers identified as A, B, C, D and E volunteer to perform an important military assignment subject to following conditions.

- Either A or B or both must go
- Either C or E, but not both, must go
- Either both A and C go or neither goes
- If D goes, then E must also go
- If B goes, then A and D must also go.

Define the variables A, B, C, D and E so that an uncomplemented variable means that the corresponding soldier is selected to go. Determine an expression which specifies the combinations of the volunteers who will be assigned satisfying the above conditions.

(8)

QUESTION 06

(a)   What are the five basic operations performed by any computer system?

(b)   Draw a block diagram to illustrate the basic organization of computer system a[...] explain the function of various units.

(c)   What is an input device? How does it differ from output device?

(d)   What distinguishes
   (i) RAM from ROM
   (ii) PROM from EPROM

(e)   What is cache memory? How is it different from primary memory?

(f)   Write short notes on (a) Control Unit (b) Random Access Memory (RAM)

SECTION C

QUESTION 07

Describe different types of activities encountered in a project and how duration of an activity can be best estimated.

The widening of a certain road requires the relocation of wayside overhead power lines for which following activities with estimates of duration (in days) have been identified.

Activity	Description	Optimistic	Mode rate	Pessimistic
a	Planning & preliminaries	6	7	14
b	Secure poles & material	4	6	8
c	Pole location coordination	1.5	2	2.5
d	Trimming trees	0.5	3	3.5
e	Set poles	4	8	12
f	Set conductors(cover old place new)	0.5	3	3.5
g	Set energies (de energize old, Energize new)	2	3	4
h	Remove old poles and connectors	4	6	8
i	Finalize (return material etc.)	0.25	0.5	1.75

Draw the network diagram based on your judgment, in order to complete the project in shortest feasible time (T). You can start with activity (a) followed by (c) and (d) in parallel. Activity (b) can follow (c), and (e) can follow (b). Use your own judgement for the rest of the activities.

Identify the critical path.

Also find the probability of completing project in T + 10% of T.

(9)

QUESTION 08

Number (N) of Internet users of a region for different years (t) is given as follows

Year (t)	2000	2002	2004	2006	2008
Number of Internet users (N)	500	1,000	2,000	10,000	20,000

If N is such that dN/dt is proportional to N, show that a linear model will not be suitable to fit a graph for N in terms of t.
Also show that $N = N_0 e^{\alpha t}$ with N_0 and α are constants, will be a suitable curve. By taking a suitable time measurement t, find N_0 and α.

Forecast figures of N for 2010 and 2012.

Also estimate the rate of increase of N per year for 2010.

QUESTION 09

ABC Company is producing electric bulbs in three plants A, B and C. It is found that each plant produces 40%, 30% and 30%, respectively and of the total items produced at each plant 2%, 4% and 3% respectively are defective. If an item produced by the company is picked up at random what is the probability that it is defective?

If 5 items produced by the company is taken at random what are the probabilities that
(a) no item will be defective, (b) 1 will be defective, and (c) more than 1 will be defective.

If a customer had reported of a defective item produced by the company, describe how the management can find which plant had most probably produced the defective item provided that there are no indications in the label giving the required information.

QUESTION 10

(i) Distribution of marks (out of 100) of a test conducted for 100 applicants for some posts is as follows;-

| Marks Range	Number
0 to less than 20	5
20 to less than 40	11
40 to less than 60	42
60 to less than 80	28
80 to 100	14

Calculate suitable central and dispersion measurements for the above distribution.

Assuming the marks are normally distributed find the percentage numbers of candidates whose marks will (a) be less than 35, (b) fall between 35 to 55, and (c) above 55.
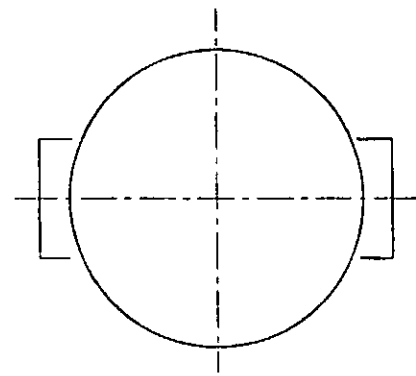
(ii) It is found that in a certain road segment an average of 1 land slide occurs per year. Calculate for this segment probabilities that the number of land slides that may occur are (a) no land slides, (b) 1, (c) 2 or more for a coming year.

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(10)

Fig. Q1

All Dimensions in mm

110

30

Ø100
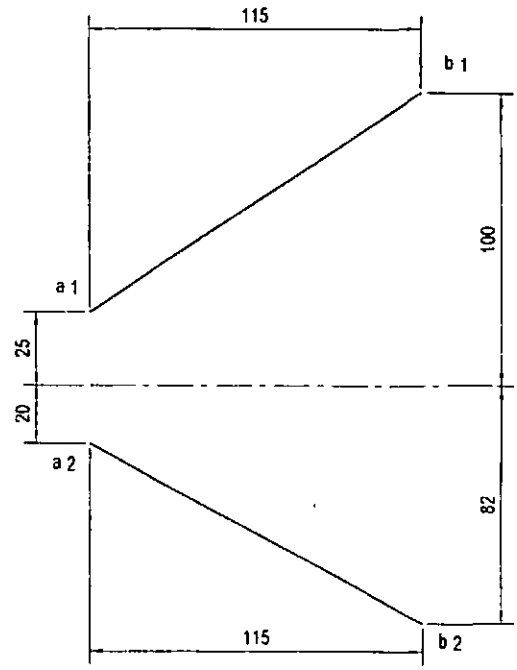
120

FRONT ELEVATION

Ø40

10
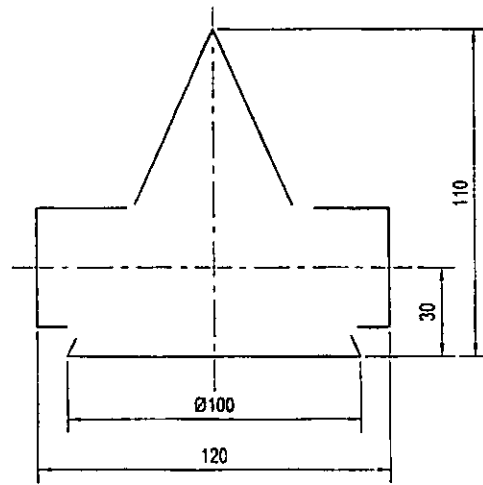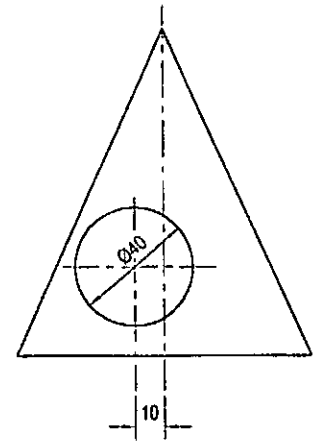
END ELEVATION

All dimensions in mm

PLAN

Fig. Q2

All dimensions in mm

Fig. Q3