

CHRISTIAN SOCIAL SERVICE COMMISSION (CSSC)
NORTHERN ZONE JOINT EXAMINATION SYNDICATE

FORM TWO PRE-NATIONAL ASSESSMENT 2026

ENGINEERING SCIENCE
(VOCATIONAL STREAM)

MARKING SCHEME.

01

SECTION A

i	ii	iii	iv	v	vi	vii	viii	ix	x
A	B	C	D	A	C	B	A	B	C

10 marks @ 1 mark each.

02

LIST A	i	ii	iii	iv	v
LIST B	C	F	D	A	B

05 marks @ 1 mark each.

SECTION B

03. (a) A wheel barrow is a second class lever.

Fulcrum: wheel, Load: between wheel and handles,
Effort: applied at the handles.

03 marks

Arrangement: Fulcrum $\rightarrow$ Load $\rightarrow$ Effort.

(b) Given Data

$$R = 10 \text{ cm}$$

$$r = 2 \text{ cm}$$

$$E = 500 \text{ N} \quad 01 \text{ mark}$$

$$L = 10,000 \text{ N}$$

$$V \cdot R = \frac{R^2}{r^2} \quad 01 \text{ mark}$$

$$V \cdot R = \frac{10^2}{2^2}$$

$$V \cdot R = 25 \quad 01 \text{ mark}$$

Then;

$$M.A = \frac{L}{R}$$

$$M \cdot A = \frac{10,000N}{500N}$$

$$M \cdot A = 20 \quad 01 \text{ mark}$$

$$\begin{aligned} \text{(ii) Then; Efficiency} &= \frac{M \cdot A \times 100\%}{V/R} \quad 01 \text{ mark} \\ &= \frac{20 \times 100\%}{25} \\ &= \frac{2000\%}{25} \end{aligned}$$

$$\text{Efficiency of hydraulic press} = 80\% \quad 02 \text{ marks}$$

04 (a) Given data

$$m = 4000 \text{ kg}$$

$$V = 10 \text{ m}^3$$

$$\rho_w = 1000 \text{ kg/m}^3 \quad 01 \text{ mark}$$

$$g = 10 \text{ m/s}^2$$

$$F_b = ?$$

$$\text{Buoyant force (F}_b\text{)} = \text{Density of water (}\rho_w\text{)} \times V_{\text{submerged}} \times \text{gravity (g)}$$

$$F_b = 1000 \text{ kg/m}^3 \times 10 \text{ m}^3 \times 10 \text{ m/s}^2$$

$$F_b = 100,000 \text{ N.} \quad 04 \text{ marks}$$

(b) Flotation check.

$$\text{Weight of Pontoon (W)} = \text{mass} \times \text{gravity}$$

$$W = 4000 \text{ kg} \times 10 \text{ m/s}^2$$

$$W = 40,000 \text{ N.} \quad 03 \text{ marks}$$

Conclusion;

The pontoon will float because its total weight (40,000 N) is less than the maximum possible upthrust force (100,000 N).
02 marks

- 05 (xi) The density of coin is greater than the density of water
(ii) The downward weight is greater than the upward buoyant force. 04 marks 02 @

(b) Given data

$$\text{Volume}(V) = 0.4 \text{ m}^3$$

$$\text{Density of water} = 1000 \text{ kg/m}^3 \text{ 01 mark}$$

$$\text{Force}(F) = ?$$

$$\text{From; } \rho = m/V \text{ 01 mark}$$

$$m = \rho V$$

$$m = 1000 \text{ kg/m}^3 \times 0.4 \text{ m}^3$$

$$m = 400 \text{ kg} \text{ 02 mark}$$

$$\text{But Force} = \text{mass} \times \text{gravity}$$

$$F = 400 \text{ kg} \times 10 \text{ m/s}^2$$

$$F = 4000 \text{ N.}$$

02 marks

$\therefore$ Buoyant force acting is 4000 N.

06 (a) Given data

$$\text{mass}(m) = 1200 \text{ kg}$$

$$u = 30 \text{ m/s}$$

$$s = 150 \text{ m}$$

$$v = 0 \text{ m/s} \text{ 01 mark}$$

$$K.E = \frac{1}{2} m v^2 \text{ 01 mark}$$

$$K.E = \frac{1}{2} \times 1200 \text{ kg} \times 30^2$$

$$K.E = 600 \times 900$$

$$K.E = 540,000 \text{ J. 02 mark}$$

(b) From; Work done = Force $\times$ distance 01 mark
$$\text{Force} = \frac{\text{Work done}}{\text{distance}}$$

$$\text{Force} = \frac{540,000 \text{ J}}{150 \text{ m}}$$

$$F = 3600 \text{ N.} \quad 0.2 \text{ marks}$$

$\therefore$ The average braking force applied were 3600 N.

(c) The kinetic energy of the moving car is converted into thermal energy (heat) and sound in the brake pads and tires due to friction. 0.2 marks

07 (a) Gear drives provides a positive drive with zero slippage. This makes them capable of transferring immense forces and maintaining precise rotating timing, whereas belt drives can slip under high load stress. 0.2 marks

(b) Given data

Rotational speed of driver = 350 rpm

Rotational speed of driven = 1400 rpm

Velocity ratio (V.R) = ? 0.1 mark

$$V.R = \frac{\text{Rotational speed of driven}}{\text{Rotational speed of driver}} \quad 0.1 \text{ mark}$$

$$V.R = \frac{1400 \text{ rpm}}{350 \text{ rpm.}}$$

$$V.R = 4. \quad 0.2 \text{ marks}$$

(c) Given data

$$V.R = 4$$

Teeth of driver = 20 0.1 mark

Teeth of driven = ?

$$V.R = \frac{\text{Number of teeth of driven}}{\text{Number of teeth of driver}} \quad 0.1 \text{ mark}$$

$$4 = \frac{\text{Driven teeth}}{20}$$

$$\text{Driven teeth} = 80 \text{ teeth.} \quad 0.2 \text{ marks}$$

09 (b) Given data

08 (a) Given data

$$u = 0 \text{ m/s}$$

$$a = 0.5 \text{ m/s}^2$$

$$t_1 = 40 \text{ s}$$

$$t_2 = 2 \text{ mins (120 s)} \text{ 01 mark}$$

$$t_3 = 20 \text{ s.}$$

$$V = ?$$

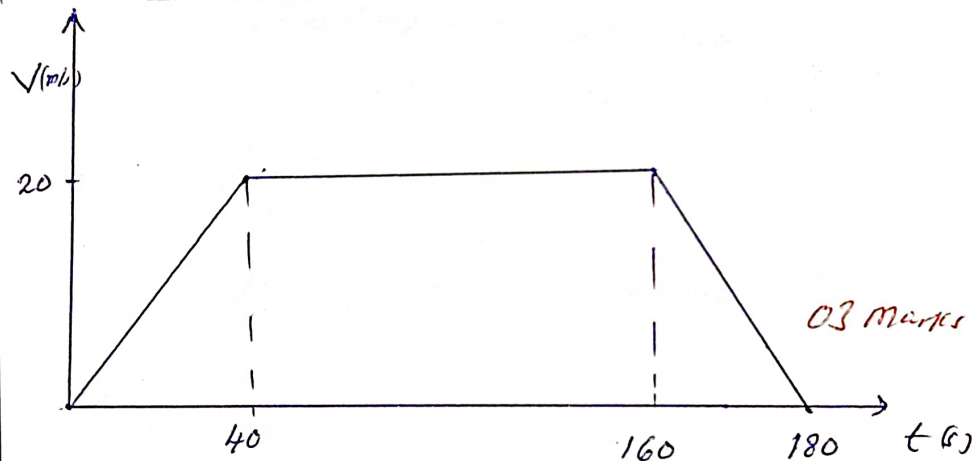
$$\text{From; } V = u + at \text{ 01 mark}$$

$$V = 0 + 0.5 \text{ m/s}^2 \times 40 \text{ s.}$$

$$V = 20 \text{ m/s. 02 marks}$$

$\therefore$ The maximum velocity reached by the train is 20 m/s.

(b) THE VELOCITY TIME GRAPH



$$\begin{aligned} \text{Total distance} &= \text{Area under the graph} \\ &= \frac{1}{2} (a+b) h \\ &= \frac{1}{2} (180+120) \times 20 \\ &= 300 \times 10 \\ &= 3000 \text{ m. } \text{03 marks} \end{aligned}$$

$\therefore$ The total distance covered is 3000 m.

09 (a) Work is the product of force and distance

Energy is the capacity of doing work

Power is the rate of doing work

The unit of work is Joule, the unit of energy also is Joule

(b) While the unit of power is Joule per second or Watts.

03 marks 10

09 (b) Given data

$$\text{mass (m)} = 25 \text{ kg}$$

$$\text{distance (d)} = 15 \text{ m}$$

$$\text{Time (t)} = 20 \text{ s}$$

$$\text{gravity (g)} = 10 \text{ m/s}^2 \quad 01 \text{ mark}$$

$$\text{Power (P)} = ?$$

$$\text{Power (P)} = \frac{\text{Work done (W)}}{\text{Time (t)}} \quad 01 \text{ mark}$$

$$\text{But Work done (W)} = F d$$

$$\text{Then; Force} = mg \quad 01 \text{ mark}$$

$$F = 25 \text{ kg} \times 10 \text{ m/s}^2$$

$$F = 250 \text{ N} \quad 01 \text{ mark}$$

$$\text{Work done} = 250 \text{ N} \times 15 \text{ m}$$

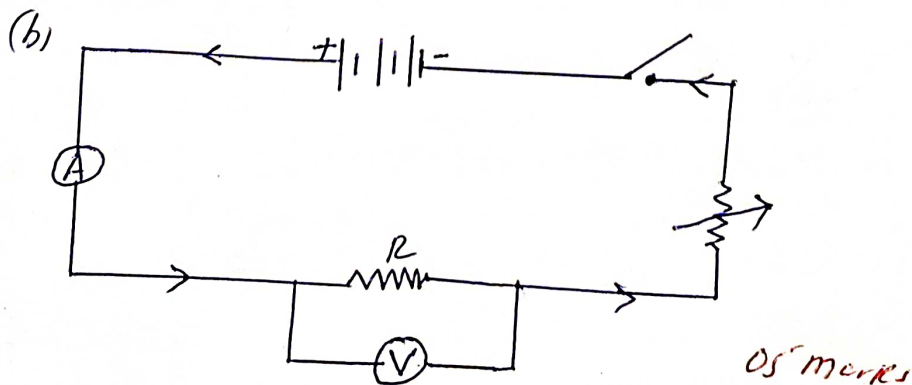
$$W = 3750 \text{ J} \quad 01 \text{ mark}$$

$$P = \frac{3750 \text{ J}}{20 \text{ s}}$$

$$P = 187.5 \text{ W} \quad 02 \text{ marks}$$

SECTION C

- 10 (a) (i) Battery
(ii) Voltmeter
(iii) Resistor
(iv) Switch
(v) Ammeter. 05 marks 01@



10 (C). Given data.

$$V = 20V$$

$$I = 4A$$

$$R = ? \quad 01 \text{ mark}$$

From, $V = IR$ (Ohm's law)

$$R = \frac{V}{I} \quad 01 \text{ mark}$$

$$R = \frac{20V}{4A}$$

$$R = 5\Omega. \quad 03 \text{ marks}$$

$\therefore$ The magnitude of resistance in the circuit is 5Ω .