Konkan Railway Corporation Ltd.

For the post of AEN / Design

Note: (a) Total time allotted is 3 hrs.

(b) Maximum Marks are 100.

(c) All answers to be written in the answer-sheets supplied.

(d) No negative marking for wrong answers.

(e) All questions in Part-A (objective) are of 2 mark each. All questions in Part B are of 10 mark each.

PART A (Objective)

Tick the correct answer:-

① One kilo-Pascal is equivalent to

(a) 1000 N/m^2

(b) 1000 N/cm^2

(c) 1000 N/mm^2

(d) None of above.

② Centre of buoyancy always

(a) coincides with the centre of gravity

(b) coincides with the centroid of the volume of fluid displaced

(c) remains above the centre of gravity

(d) remains below the centre of gravity

③ In the most general form of Bernoulli's equation $\frac{p}{w} + \frac{V^2}{2g} + Z = \text{constant}$, each term represents

(a) energy per unit mass

(b) energy per unit weight

(c) energy per unit volume

(d) none of the above

④ The best hydraulic channel cross-section is the one which has a

(a) minimum roughness coefficient

(b) least cost

(c) maximum area for a given flow

(d) minimum wetted perimeter

⑤ In surveying, which of the following scales is largest one?

(a) 1 cm = 50 m

(b) 1 : 42000

(c) R.F. = $\frac{1}{300000}$

(d) 1 cm = 50 km

⑥ For a chord of 60 m, the mid-ordinate for a circular curve of 50 m radius will be

(a) 10 m

(b) 12.5 m

(c) 15 m

(d) 18.75 m

⑦ S-hydrograph is used to obtain unit hydrograph of

(a) shorter duration from longer duration
(b) longer duration from shorter duration
(c) both (a) & (b)
(d) none of the above

⑧ In highway design, camber in the road is provided for

(a) effective drainage
(b) counteracting the centrifugal force
(c) having proper sight distance
(d) (a) & (b) above.

⑨ Rapid curing cutback bitumen is produced by blending bitumen with

(a) kerosene
(b) benzene
(c) diesel
(d) petrol

⑩ The rail in railways is designated by its

(a) length
(b) weight
(c) cross-section
(d) weight per unit length

⑪ Figure represents a

(a) goods yard
(b) gravitational yard
(c) hump yard
(d) loco yard in railways.

(12) Pert (PERT) technique of network analysis is mainly useful for

(a) small projects
(b) large & complex projects
(c) research and development projects
(d) deterministic activities

(13) If the sand in-situ is in its densest state then the relative density of sand is

(a) zero
(b) 1
(c) between 0 and 1
(d) greater than 1

(14) The ratio of the undisturbed shear strength to the remoulded shear strength in cohesive soils under undrained conditions is

(a) zero
(b) 1
(c) greater than 1
(d) between 0 and 1.

(15) Allowable bearing pressure for a foundation depends upon

(a) allowable settlement only
(b) ultimate bearing capacity of soil only
(c) both allowable settlement and ultimate bearing capacity
(d) none of the above

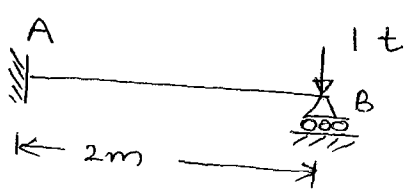
(16) Number of bricks required for one cubic metre of brick masonry is

(a) 400
(b) 450
(c) 500
(d) 550

(17) Modulus of rigidity is defined as the ratio of

(a) longitudinal stress to longitudinal strain
(b) shear stress to shear strain
(c) stress to strain
(d) longitudinal stress to volumetric strain.

(18) The reaction at support A of the propped cantilever beam shown in figure below is



(a) 0
(b) 1 t
(c) 0.5 t
(d) 2 t

(19) The ratio of intensity of stress in case of a suddenly applied load to that in case of a gradually applied load is

(a) 1/2
(b) 1
(c) 2
(d) more than 2.

(20) Strain energy stored in a member is given by

(a) 0.5 x stress x strain

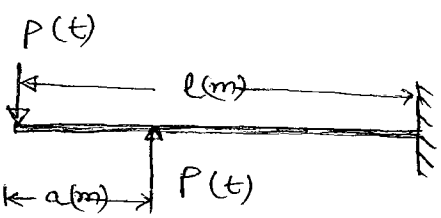
(b) 0.5 x stress x volume

(c) 0.5 x stress x strain x volume

(d) 0.5 x strain x volume.

PART B

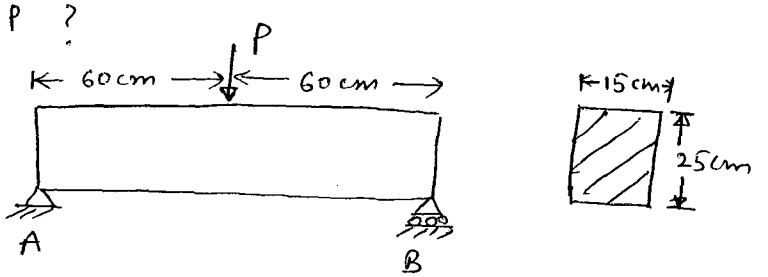
(1) Construct shear force and bending moment diagrams for the cantilever beam loaded as shown in figure -



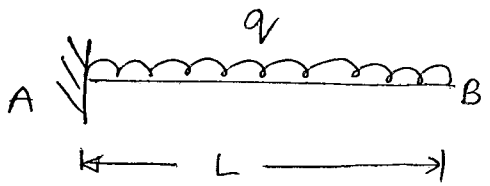
(t) tonne

(m) metre

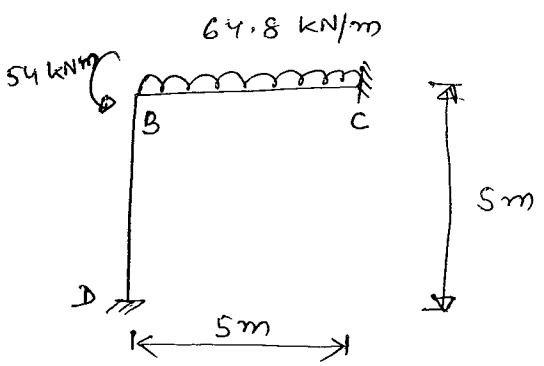
(2) A simply supported wood beam of rectangular cross section carries a concentrated load P at its mid-section as shown in figure. Allowable working stress in tension or compression and in shear parallel to the grain are given as follows: $\sigma_w = 70\ kg/cm^2$, $\tau_w = 11\ kg/cm^2$. What is the safe value of load P ?



(3) Determine the equation of the deflection curve for a cantilever beam AB subjected to a uniform load of intensity q. Also, determine the deflection δ_b and angle of rotation θ_b at the free end.



(4) Analyse the rigid frame shown in figure. Determine the axial forces, shears and moments in all members. Sketch the elastic curve.



(5) A reinforced concrete beam 300 mm wide is reinforced with 1436 mm^2 of Fe 415 HYSD bars at an effective depth of 500 mm. If M-20 grade concrete is used estimate the moment of resistance of the section.

(6) A retaining wall 8m height with a smooth vertical back retains the following material:

Top 2m: Clay $\gamma = 17.5\ kN/m^3$, $\phi = 0$, $c = 10\ kN/m^2$

Bottom 6m: saturated sand $\gamma_s = 19.5\ kN/m^3$, $\phi = 30^\circ$

If the water level is on top of the sand layer, draw the diagram of lateral pressure on the wall assuming that no tension crack develops on the top layer.