NOTICE-1

Ref. Advt. No. 10/2023

SYAMA PRASAD MOOKERJEE PORT- KOLKATA, HALDIA DOCK COMPLEX

(Jawahar Tower Complex, Haldia Township, Purba
Medinipur, West Bengal, Pin – 721607)

Written Examination for selection of Jr.Engineer (on contract)

under I&CF Division of Haldia Dock Complex.

WrittenTestVenue	: DAV Public School, Haldia.
	P.O.–HaldiaTownship,Dist.-PurbaMedinipur,
	West Bengal –721607.
DateofTest	:**17.03.2024**
ReportingTime	: **10.30hrs.**

Model Question Paper with Answer: Refer to **'Annexure – I'.**

Structure of the selection test for engagement of Jr.Engineer (on contract) under I&CF Division, HDC.

The selection methodology shall consist of Written Test only.

A. The written test shall consist of 100 marks with overall qualifying marks being 50.

The question paper shall consist of four sections A, B, C, D. Each candidate needs to qualify both in Section-A & Section-B separately as per the qualifying marks stated in the respective section of Annexure-I. There is no separate qualifying mark in Section-C & Section-D.

General Instructions to the candidates:

1. Call lettershavebeenissuedtotheprima-facieeligiblecandidatesbothbyspeedpostandalsobye-mail.Ifany candidate doesnotreceive Call letterbypost,he/she mayalsotakeaprintoutofthe Call letter received through their e-mail and appear for the written test.

2. The candidate must bring the Call letterwith recent passport size coloured photograph affixed in the space providedatthetimeofappearingforthewrittenexamination.No candidatewillbepermittedtoentertheexaminationCentrewithoutthecall letter.

3. TheCall lettersalongwithaffixedpassportsizecoloured photographwillbecollectedintheexaminationhall and therefore the candidate is advised to keep one photocopy of the Call lettersfor own reference.

4. Candidate must produce at least one photo IDENTITY PROOF in original such as Passport, DrivingLicence,VoterCard,AadhaarCard,PanCardalongwithaself-certifiedphotocopyofthesameattheexaminationCentre,failingwhich, HE/SHESHALLNOTBEALLOWEDTOAPPEARFORTHEEXAMINATION.

5. Thecandidateshouldreachtheexamination Centre/Venueatthereportingtime.Latecomerswill notbepermittedtoappearinthetest.TheyshouldbringgoodqualityBLACK/BLUEballpoint penand non-programmable calculator foranswering thetestquestions.UseofPencilsisstrictlyprohibitedforansweringquestions.

6. Candidature for the test is provisional and subject to fulfilling all the eligibility conditions asindicated in the advertisement. Receipt of Call letter by the candidate is not to be construed as acceptanceofthecandidate'seligibilityforselection.If,atanystage,itisfoundthatthecandidate is ineligible for sitting in the written examination or at any subsequent stage his / her candidature will berejected.

7. Candidatesarenotallowedtocarryanyother items in the examination hall viz. papers,notes,books,pagersormobilephone, smart watchor otherelectronicdevices,etc.Anycandidatefoundusingorinpossessionofsuch unauthorised material or indulging in copying or adopting unfair means, is liable to besummarily disqualified.

8. Requestforchangeofcentre/venuewillnotbeentertainedunderanycircumstances.

9. NoTravellingallowancewillbereimbursedforappearingintheWrittenTest.

10. Candidatesarerequiredtomaintainphysicaldistancewhenqueuingupforentry.

11. Bags / Books / Mobile phones etc.shallnotbeallowedintheExaminationhall.Designatedspacewouldbe provided by HDC for keeping suchitems at their own risk.

12. Sharing of personal belongings / stationary shall not beallowed.

Annexure-I

Model Question Paper

MODEL QUESTION PAPER (CIVIL)
Written Test for selection to the post of Junior Engineer under I &CF Division

Total duration –3 hr **Full marks – 100**
Qualifying Marks-50

Note: The Question paper consists of four Sections A, B, C & D.

Criteria for qualification in the Examination:
Each Candidate needs to qualify both in Section-A & Section-B separately as per the qualifying marks stated in the respective Section. There is no separate qualifying mark in Section -C & Section -D.

SECTION-A
Full Marks-40 **Qualifying Marks-20**

Please read the Questions carefully and write answers in the demarcated space. [40 x 1=40]

1. Clear cover for a column should not be less than

   1) 12mm 2) 25mm 3) 40mm 4) 75 mm

2. The maximum spacing of shear reinforcement along the axis of the member for vertical stirrups is

   1) 0.5d 2) 0.75d 3) 1.0d 4) 1.5d

3. The minimum cement content required in RCC to ensure durability for moderate exposure is

   1) 250kgs/m^3 2) 300kgs/m^3 3) 360kgs/m^3 4) 400kgs/m^3

4. The full width of land acquired before finalisation of highway alignment is known as

   1) Formation width 2) Carriage way 3) Right of way 4) Shoulder

5. Bottom-most component of a flexible pavement is

   1) Sub-base 2) Subgrade 3) Base 4) Wearing course

6. The size range for aggregate of IRC grading-II is

   1) 90mm – 40mm 2) 63mm – 45mm 3) 53mm – 22mm 4) 10mm-20mm

7. The aggregate impact value for WMM should not exceed

   1) 30% 2) 40% 3) 50% 4) 60%

8. Which of the following defect appears due to presences of alkalies in the bricks?

   1) Bloating 2) Black core 3) Cracks 4) Efflorescence

9. There are two hinged semi-circular arches A,B and C of radii 5 m, 7.5 m, and 10 m respectively and each carries a concentrated load W at their crowns. The horizontal thrust at their supports will be in the ratio of

   1) 1 : 1 ½ : 2 2) 2 : 1 ½ : 1 3) 1 : 1 : 2 4) None of these

10. In which of the following test of bitumen Ring and Ball apparatus is used?

1)Penetration test 2) Softening point test

3) Viscosity test 4) Flash and fire point test

11. The defect in timber that causes longitudinal separation of woods between the annular rings is known as_____.

1) knots 2) rind gall 3) shakes 4) twisted fibres

12. In which of the following unit kinematic viscosity of fluid is measured?

1) m/s 2) m/s^2 3) dyne 4) stokes

13. The hydraulic radius and cross-sectional area of a channel is given by 4.5 m and 18.5 sq.m respectively. What is the wetted perimeter (m) of channel?

1) 4.11 2) 10.5 3) 18.5 4) 83.3

14. The water is flowing through 800 m long circular pipe of diameter 30 cm with the velocity of 0.26 m/s. The friction factor for the pipe is given as 0.016. What is the head loss (cm) in the pipe due to friction?

1) 5.5 2) 14.7 3) 21.3 4) 35.6

15. If at the particular instant of time, the velocity of flow does not change with location over a specific region, the flow is called as_____.

1) steady flow 2) unsteady flow 3) uniform flow 4) non-uniform flow

16. Which of the following statement is correct for sprinkler irrigation method?

1) It is used for rice and jute. 2) It is used for the soil has very low infiltration rate.
3) It is best suitable for very light soil. 4) It requires borders and field channel.

17. Calculate the safe stopping sight distance for a design speed of 60 km/h for two way traffic on a single lane road. The reaction time of driver is 2.5 sec.

1) 82.21 2) 136.23 3) 164.42 4) 674.24

18. You have determined the the RL of a hardstand as +7.655m based on the staff reading as +1.265m you have observed in survey, What is the HI?

(1) 7.655m (2) 6.390m (3) 8.920m (4) None the above

19. Which one of the following emission is the primary reason for the depletion of the ozone layer?

1)CO_2 2) CFC's 3) CO 4) NO_2

20. According to the Unwin's formula, if t is the thickness of the plate in mm, the nominal diameter of the rivet is

1) d=1.91t 2) d=1.91 t2 3) d=1.91 $\sqrt{t}$ 4) None of these

21. Effective length of a column effectively held in position at both ends and restrained in direction at one end is

1) L 2) 0.67 L 3) 0.85 L 4) 1.5 L

22. The most economical section for a column is

1) rectangular 2) solid round 3) flat strip 4) tubular section

23. If the unsupported length of a stanchion is 4 meters and least radius of gyration of its cross-section is 5, the slenderness ratio of the stanchion is

1) 60 2) 70 3) 80 4) 90

24. In rolled steel beams, shear force is mostly resisted by

1) web only 2) flanges only 3) web and flanges together 4) None of these

25. For a cantilever beam of length L built-in at the support and restrained against torsion at the free end, the effective projecting length 'l' is

1) l = 0.7L 2) l = 0.75L 3) l = 0.85L 4) None of these

26. Pick up the correct statement from the following:

1) The steel beams placed in plain cement concrete are known as reinforced beams

2) The filler joists are generally continuous over three supports only

3) Continuous fillers are connected to main beams by means of cleat angles

4) Continuous fillers are supported by main steel beams

27. Segregation is responsible for

1) honey-combed concrete 2) porous layers in concrete

3) surface scaling in concrete 4) All option are correct

28. Concrete mainly consists of

1) cement 2) aggregates 3) admixture 4) All option are correct

29. Expansion joints are provided if the length of concrete structures exceeds

1) 10 m 2) 15 m 3) 25 m 4) 45 m

30. A flaky aggregate is said to be elongated if its length is

1) equal to the mean size 2) twice the mean size

3) thrice the mean size 4) four times the mean size

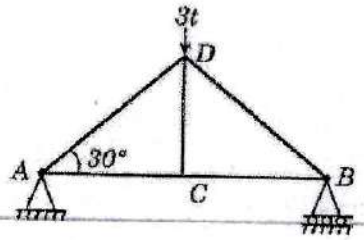
31. The deflection of a uniform circular bar of diameter d and length l, which extends by an amount e under a tensile pull W, when it carries the same load at its midspan is

1) el/2d 2) (e2 l)/(3d2) 3) (el2)/(3d2) 4) √e/(3d2)

32. The moment of inertia of a triangular section (height h, base b) about its base is

1) $(bh^2)/12$ 2) $(b^2h)/12$ 3) $(bh^3)/12$ 4) $(b^3h)/12$

33. In the truss shown below the force in the member BC is



1) 3.0 t compression 2) 3.0 t tension 3) (3√3)/2 t tension 4) (3√3)/2 t compression

34. Fundamental relationship between dry density (γ_d), bulk density (γ) and water content (w)

(1) $\gamma_d = \frac{\gamma}{1+w}$ (2) $\gamma = \frac{\gamma_d}{1+w}$ (3) $w = \frac{\gamma}{1+\gamma_d}$ (4) None

35. As per IS 456 2000 During casting of a Concrete structure of volume 130 CuM the number of samples of concrete cubes to be taken should be

(1) 13 (2) 6 (3) 24 (D) None the above

36. While executing a drainage project from Location A to Location B, you have to fix the invert level of an intermediate point X. Given that invert level of A=6.215m, B= 5.150m, AB=2100m, AX=790m and the drain is having uniform slope.

(1) 5.551m (2) 5.814m (3) 5.683 (4) None the above

37. A concrete using an air entrained cement

1) has strength less than 10% to 15% 2) has more resistance to weathering

3) is more plastic and workable 4) is free from segregation and bleeding

38. If W is the weight of a retaining wall and P is the horizontal earth pressure, the factor of safety against sliding is

1) 1 2) 1.25 3) 1.5 4) 2

39. A sample of cement is said to be sound when it does not contain free

1) lime 2) silica 3) iron oxide 4) alumina

40. Damp Proof Course in a residential Building is provided at

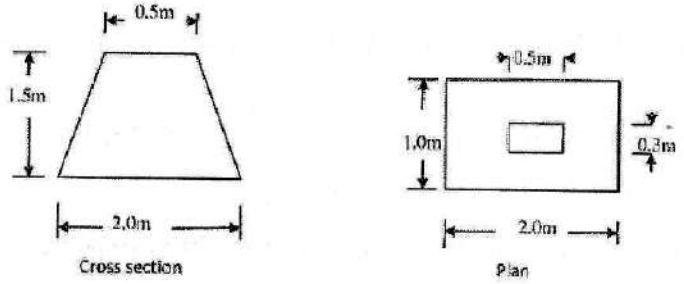
1) Roof level 2) Sill level 3) Plinth level 4) None of the above

SECTION - B

Full Marks-36
Qualifying Marks-18

Please read the Questions carefully and write answers in the demarcated space. [9 x 4=36]

1. Figure below shows the trapezoidal portion of a foundation, compute the volume



2. In a sieve analysis of a fine aggregate, you have found out the following results. Find out the FM of the fine aggregate?

IS SIEVE	MASS RETAINED	% MAS RETAINED
4.75 mm	0.0	0.0
2.36 mm	6.0	0.6
1.18 mm	28.0	2.8
600 micron	182.0	18.2
300 micron	608.0	60.8
150 micron	170.0	17
Pan	6.0	

3. Calculate the total weight and weight per metre length of a solid circular steel bar having 500 mm diameter and 10.00 m in length. Density of steel may be assumed as 7850kg/cum.

4. Define the following

(i) Superelevation , (ii) High flood level.

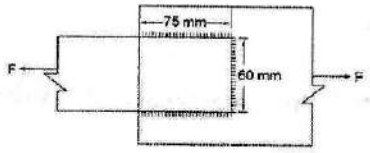
5. Define the following

(i) Optimum Moisture Content , (ii)Benchmark

6. Define the following

i) What is do you mean by 'TMT' and why is it used in place of normal steel in construction ?
ii) Define 'Contour' with sketch.

7. Find the safe load that can be transmitted by fillet-welded joint shown in the figure. The size of weld is 6mm. (Safe stress in the weld, Pa = 108 MPa)



8. Draw a longitudinal section of a Septic tank having length = 4.00m and height =1.50m. Assume thickness of the wall.

9. Draw a sectional details of a retaining wall. Mark all parts. Drawing can be drawn without scale

SECTION - C
Full Marks -20

Please read the Questions carefully and write answers in the demarcated space. [5 x 4=20]

1. Write full form

i)	MS Handles	ii) MDD	iii) SBC	iv) PERT	v) CPM
vi)	WMM	vii) PWD	viii) MORTH	ix) RCC	x) OMC

2.Fill in the blanks

(i) Steel reinforcement is provided in RCC to take the _____ force.

(ii) The minimum clear cover an RCC beam is _____.

(iii) Slump test is used to determine _____ of concrete.

(iv) The weight of 5m length of 16mm dia. reinforcing steel bar is ____kgs.

(v) 7500m is equal to ____Km.

3. Prepare preliminary estimate of a two storied RCC Office building having plinth area of 250.00 Sq.m. for ground floor and 150.00 sq.m for first floor. Rate may be assumed as Rs.2500.00/sq.m for both the floor. The following components are to be added:

(i) Internal Electrification = 40 % of Civil Cost

(ii) Water supply and sanitary = 15 % of Civil Cost

(iii) Quality control = 1% on overall cost

(iv) W/C establishment = 2% on overall cost

(v) Contingencies = 3% on overall cost

4.

A) Fill in the blanks

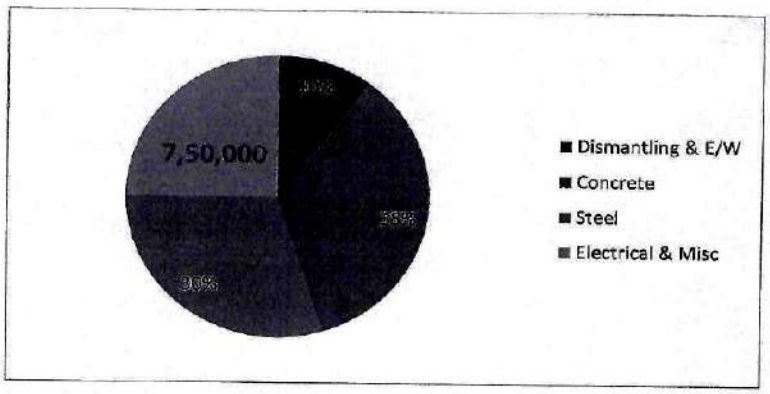
(i) The highest point on a carriage way is known as _____.

(ii) The length of a road visible ahead to the driver at any instant is called _____.

(iii) The transverse inclination of the pavement surface to counteract the effect of centrifugal force is called _____.

B) Answer the following

In following Pie Chart, the major components of a project are shown. Find out the Total Project Cost?



SECTION - D
Full Marks -4

(1) Write short Note on " Effect of Covid-19 on Indian economy".

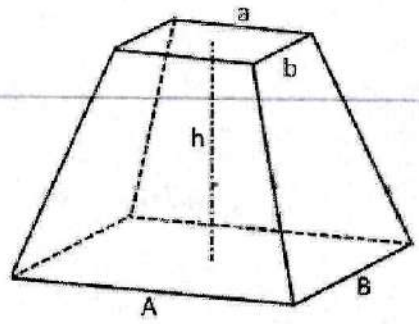
Answer Sheet

Section A:

1. (3) 40 mm
2. (2) 0.75d
3. (2) 300kgs/m^3
4. (3) Right of way
5. (2) Subgrade
6. (2) 63mm – 45mm
7. (1) 30%
8. (4) Efflorescence
9. (3) 1 : 1 : 2
10. (2) Softening point test
11. (3) shakes
12. (4) stokes
13. (1) 4.11
14. (2) 14.7 cm
15. (3) uniform flow
16. (3) It is best suitable for very light soil
17. (3) 164.42
18. (3) 8.920m
19. (2) CFC's
20. (3) d=1.91 √t
21. (3) 0.85 L
22. (4) tubular section
23. (3) 80
24. (1) web only
25. (2) l = 0.75L
26. (4) Continuous fillers are supported by main steel beams
27. (4) All option are correct
28. (4) All option are correct
29. (4) 45 m
30. (2) twice the mean size
31. (3) (el2)/(3d2)
32. (3) (bh^3)/12
33. (3) (3√3)/2 t tension
34. (1) $\gamma_d = \frac{\gamma}{1+w}$
35. (2) 6
36. (2) 5.814m
37. (3) is more plastic and workable
38. (3) 1.5
39. (1) lime
40. (3) Plinth level

Section B:

1.



Answer: Using the frustum formula, the volume of the truncated rectangular pyramid can be expressed as $V = (h/3) X (a b +(a b c d)^{1/2}+ c d)$ when the dimension of the sides of its 2 bases are known.

So, volume of foundation = $(1.5/3) \times (2 \times 1 + (2 \times 1 \times 0.5 \times 0.3)^{1/2} + 0.5 \times 0.3) = 1.35\ m^3$

2.

Sl No	I S Sieve Designation	Mass Retained(gm)	Mass Retained (%)	Cum. Mass Retained(%)	Cumulatve (%) Passing
1	4.75 mm	0.0	0.0	0.0	100.0
2	2.36 mm	6.0	0.6	0.6	99.4
3	1.18 mm	28.0	2.8	3.4	96.6
4	600 micron	182.0	18.2	21.6	78.4
5	300 micron	608.0	60.8	82.4	17.6
6	150 micron	170.0	17.0	99.4	0.6
7	Pan	6.0			
	FM			**2.07**	

3.

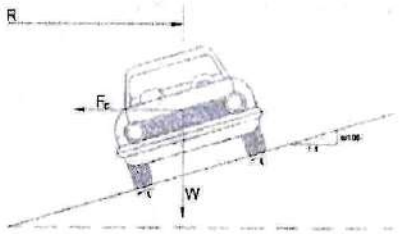
Per m weight of the bar = $(3.14 \times 0.5^2)/4 \times 7850 = 1540.56$ Kg/m

Total weight of the bar = $1540.56 \times 10 = 15405.6$ Kg

4.

(i) Superelevation.

Answer: Superelevation is the transverse slope provided to counteract the effect of centrifugal force and reduce the tendency of vehicle to overturn and to skid laterally outwards by raising the pavement outer edge with respect to inner edge. superelevation is represented by "e ".



Superelevation in Highway engineering

(ii) High flood level.

Answer: A high flood level is the maximum level to which a body of water could rise due to rainwater and runoff during a flooding event. High flood level calculations take into account local conservation or reclamation efforts supported by artificially constructed measures such as water storage tanks. High flood level information for a specific site can be used for planning purposes to help determine a design flood level.

5.

(i) Optimum Moisture Content.

Answer: Optimum Moisture Content (OMC) is the water content at which the soil attains maximum dry density after a given compaction effort. At OMC the soil would have lowest porosity. The Proctor compaction test (PCT) is a laboratory method of experimentally determining the optimal moisture content at which a given soil type will become most dense and achieve its maximum dry density.

(ii) Bench Mark.

Answer: Bench mark is point of known elevation i.e. R.L. This is the point for starting of Levelling work. There are different types of bench mark. Permanent bench mark, temporory benchmark and arbitrary bench mark. The Levelling work is started from permanent bench mark of which elevation is known. During survey a temporory point is left on so that work can be resumed from that point and it is called as temporary benchmark. At some remote places, where permanent benchmark is not available nearby and the work is of small nature then by assuming the value of bench mark the levelling is carried out. That point is called as arbitrary benchmark.

6.

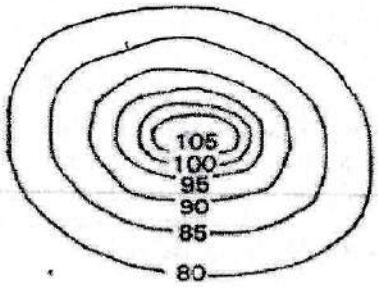
i) TMT stands for '**Thermo Mechanically Treated**'. TMT bars have **high strength** and **better corrosion resistance** compared to normal steel.

ii)

- A line on a map joining points of equal height above or below sea level.

or

- A line (as on a map) connecting the points on a land surface that have the same elevation



7.

Answer: Strength of weld = Permissible stress in weld x Area of weld

Permissible stress in weld = 108 MPa

Effective length of weld, l = 75 x 2 + 60 = 210 mm

Size of weld, s = 6 mm

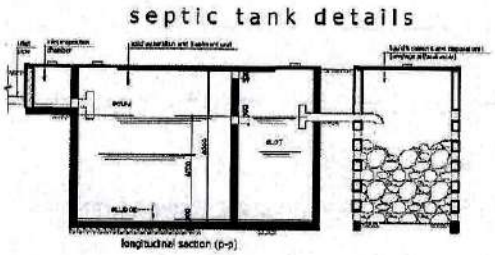
Throat thickness of weld, t = Ks = 0.7 x 6 (assuming K = 0.7) = 4.2 mm

Weld area = 4.2 x 210 = 882 sq mm

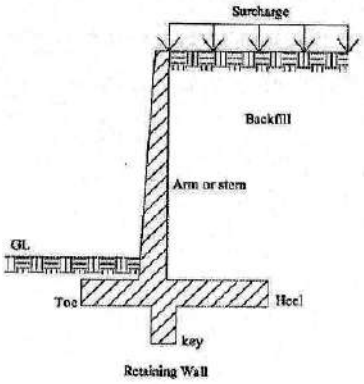
Strength of weld = 108 x 882 = 95256 N = 95.2 KN

Thus the safe load that can be transmitted by fillet-welded joint is 95.2 KN

8.



9.



Section C:

1.

i) Mild Steel Handles
ii) Maximum Dry Density
iii) Safe Bearing Cpacity
iv) Program Evaluation and Review Technique
v) Critical Path Method
vi) Wet Mix Macadam
vii) Public Work Department
viii) Ministry of Road Transport & Highways
ix) Reinforced Cement Concrete
x) Optimum Moisture Content

2.

i) Tensile
ii) 20 mm
iii) Workability
iv) 7.9 kg
v) 7.5

3.

Total built up area = 250+150 = 400 sqm

Cost of civil construction of the building = 400 x 2500 = Rs 10,00,000.00

Cost of Internal electrification = 0.4*1000000.00 = Rs 4,00,000.00

Cost of Water supply and sanitary = 0.15*1000000.00 = Rs 1,50,000.00

Cost of constructing the Building = Rs 15,50,000.00

Cost of Quality control = 0.01*15,50,000.00= Rs 15,500.00

Cost of W/C establishment = 0.02*15,50,000.00= Rs 31,000.00

Cost of Contingencies = 0.03*15,50,000.00 = Rs 46,500.00

Total cost of Building = Rs 16,43,000.00

4.

A)

i) crown of the road

ii) sight distance

iii) superelevation or cant or banking

B)

Ans: [100 X 7,50,000] / [100-(30 + 35 + 10)] = 30,00,000