

No. 8/1/2014-E.2/2310
Central Water Commission
Establishment I Section

dt. 19/11/14

Sub: Uploading of Sample Papers – reg.


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A set of sample papers of PP-I, II and III for guidance of candidates appearing in the 49th Departmental Examination is enclosed. It is requested that the same please be uploaded on CWC Website.

Encl: as above.


(D.R. MEENA)

UNDER SECRETARY


Director, SMD, CWC


Copy to :

1. All candidates appearing in the 49th Departmental Examination.
2. Notice Board.


19-11



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19/11/14

GOVERNMENT OF INDIA
CENTRAL WATER COMMISSION

49th DEPARTMENTAL EXAM FOR ENGINEERING OFFICERS, FEBRUARY 2015

PROFESSIONAL PAPER NO. - II

Time: 3 hours
100

TOTAL MARKS:

Instructions:

1. Write Roll No. on the FLY LEAVES of Answer Books.

SECTION - A (Common to both Civil and Mechanical Engineers)

Instructions:

MAXIMUM MARKS : 50

1. Please attempt **ALL TWENTY** Multiple choice objective type questions. Choose the correct option.
2. All questions carry one mark each.

MULTIPLE CHOICE OBJECTIVE TYPE QUESTIONS

Q.No.1 Arrange in order 1.Construction stage 2.DPR 3.PFR 4.FR

- a) 1,2,3,4
- b) 3,4,2,1
- c) 2,1,4,3
- d) 3,4,1,2

Q.No.2 Normally a geological map (Toposheets) in India are available with

- a) 1:50000 or 1:25000 scale with contour interval 20m to 40 m
- b) 1:1000 or 1:2000 scale with contour interval 1m to 2 m
- c) 1:10000 or 1:20000 scale with contour interval 10m to 20 m
- d) 1:5000 or 1:7000 scale with contour interval 1m to 2 m

Q.No.3 Piping failure in the Embankment dam body starts from

- a) Up steam
- b) down stream
- c) Middle of the dam body
- d) All the above

Q.No.4 As per IS 11223 Intermediate dam is classified as

- a) Gross Storage between 0.5MCM and 10 MCM
- b) Hydraulic head between 7.5 m and 12 m
- c) both a) and b)
- d) None of the above

Q.No.5 As per the Guidelines for Preparation of Detailed Project Report (DPR) of Irrigation and Multipurpose Projects, 2010, of CWC the interval of elevation of drifts on each abutments should be

- a) 30 m
- b) 40 m
- c) 50 m
- d) 60 m

Q.No.6 In the flood management project for Benefit-Cost ratio computations average annual damage should be computed on the basis of at least last data of

- a) 10 years
- b) 15 years
- c) 20 years
- d) 25 years

Q.No.7 Construction of embankment in Flood Protection schemes are designed for

- a) 25 year frequency for agricultural area
- b) 50 year frequency for Urban area
- c) 75 Year frequency for urban area
- d) 20 year frequency for agricultural area

Q.No.8 Detailed Sub Head under I-Works in the DPR, The letters A,B,C define

- a) Falls, land, works
- b) Preliminary, bridges, Land
- c) Buildings, works, Land
- d) None of the above

Q.No.9 The percentage provision on Establishment should be considered on

- a) Cost of Works
- b) Cost of Works less Land
- c) Cost of Works plus land
- d) None of the above

Q.No.10 Multi Purpose River Valley Projects may have following components

- a) Power component only
- b) Irrigation component only
- c) Flood component only
- d) All the above

Q.No.11 National Water Resources Council set up by the Government of India in 1983 is chaired by:-

- a) The Union Minister of Water Resources.
- b) Secretary Union Ministry of Water Resources.
- c) The Prime Minister of India.
- d) State Chief Ministers on rotational basis.

Q.No.12 Which among the following is a function of National Water Board:-

- a) To review the progress achieved in implementation of the National Water Policy and to report the progress to the National Water Resources Council from time to time.
- b) To lay down the National Water Policy and to review it from time to time.
- c) To consider and review development plans submitted to it (including alternative plans) by the National Water Development Agency, the River Basin Commissions etc;
- d) To deal with Inter-State Water Disputes.

Q.No. 13 In river basin planning, the normal questions that the planner is asked to answer through economic analysis are:

- a) Which are the projects to be taken up?
- b) What are their scales of development?
- c) When are they to be commissioned?
- d) All of the above

Q.No. 14 As per preamble of National Water Policy-2012, India has more than 18 % of the world's population, but the % of world's renewable water resources possessed by it is only:-

- a) 4
- b) 5
- c) 6
- d) 3

Q.No. 15 As per assessment made by Rashtriya Barh Ayog (RBA), the flood prone area in India is:-

- a) 35 Million Hectare

- b) 40 Million Hectare
- c) 45 Million Hectare
- d) 50 Million Hectare

Q. No.16. India has some sort of hydrological data sharing arrangements with these countries:-

- a) Upper riparian countries only.
- b) Lower riparian countries only.
- c) Nepal, Bhutan, China, Bangladesh and Pakistan.
- d) None of the above.

Q. No.17. Orange flood bulletin is issued when river water level:-

- a) is between warning level and danger level
- b) is 10 cm. below warning level
- c) has crossed danger level but is more than 50 cm. below HFL
- d) has crossed danger level but is less than 50 cm. below HFL

Q. No. 18. Which among the following is not associated with National Perspective Plan:-

- a) Ravi Beas link
- b) DamangangaPinjal Link
- c) Mahanadi Godavari Link
- d) SrisilamPennar Link

Q.No. 19.The agency mandated to carry out water balance studies towards implementation of National Perspective Plan:-

- a) Central Water Commission
- b) National Water Development Agency
- c) WAPCOS(I) Limited
- d) National Institute of Hydrology

Q. No. 20. As per assessment of water resources (CWC, 1993) the average annual water resources potential of the country is

- a) 1123 BCM
- b) 1869 BCM
- c) 1896 Maf
- d) 4000 BCM

SHORT ANSWER TYPE QUESTIONS

Instructions:

Please attempt **THREE** short answer type questions out of five. All questions carry 10 marks each.

Q-1

Write short notes on the following related to sub surface exploration.

- a) Pits and trenches
- b) Borings
- c) Drifts and Shafts
- d) Geophysical methods
- e) In situ field tests
- f) Laboratory tests

Q-2 Discuss the following while preparing the DPR of Flood Management Schemes

- a) Hydrology
- b) Drawings and data
- c) Procedure for calculation of Benefit- Cost ratio

Q-3.Explain Structural and non-structural measures of Flood Management.

Q-4. Explain Decision Support System (DSS) for basin planning.

Q-5. Explain the main reasons for cost escalation of river valley projects and the remedies for avoiding the same.

SECTION – B (For Civil Engineers only) [with related books]

MAXIMUM MARKS : 50

1. Please attempt **TWO QUESTIONS** out of three.
2. All questions carry equal marks.

Q.1) A tributary of a river in alluvial soil is crossing a canal. Design a suitable Cross-drainage structure for the data given below:

Particulars of the tributary :

Average Bed Level	:	25.33 m
Design Flood	:	1283.55m ³ /s.
HFL	:	33.47m.

Bank to Bank width	=	165.0m
Silt factor	=	2.0

Particulars of canal

Bed level of canal	=	37.44 m
Bed Slope	=	1 in 5000
Side slope	=	1.5 H:IV
Type of lining	=	Plain cement concrete.
Design discharge	=	12.8 m ³ /s

Assume any other data as suitable.

Draw a neat sketch showing transition in General Layout plan.

(25 marks)

Q.2)

- a) Explain the following types of hydropower schemes which are classified based on the quantum of water available and the type of diversion/storage structures provided: Also give name of one hydroelectric project in India for each category.

- I. Run-of-the river schemes
- II. Storage schemes
- III. Pumped storage schemes

(3X5=15 marks)

- b) What are the hydraulic losses to be considered in the design of water conductor system for a hydroelectric project? Write the formula for computation of each of these losses.

(10 marks)

Q.3)

- a) Mark the following components in the schematic diagram of an underground hydroelectric project shown in fig(a):

- i. Upstream water level
- ii. Power intake
- iii. Trash rack structure
- iv. Head Race Tunnel (HRT)
- v. Surge Shaft
- vi. Pressure Shaft
- vii. Power House Cavern
- viii. Transformer Cavern
- ix. Bus duct Tunnel
- x. Tail Race Tunnel (TRT)
- xi. Downstream water level

- b) Describe the following:

(10 marks)

- a. Rock mass classification as per Q-system (Rock Mass Quality)
- b. Different rock support system used for underground tunnels and caverns.

(2x5 =10 marks)

- c) From the given data, calculate the thickness of penstock steel plate for internal pressure:

Internal diameter of penstock =	4.0 m
Design internal pressure	= 24.0 kg/cm ²
Allowable stress for steel	= 1866 kg/cm ²
Joint efficiency	= 0.9

(5 marks)

SECTION – C (For Mechanical Engineers only)[with related books]

MAXIMUM MARKS : 50

1. Please attempt **TWO QUESTIONS** out of three.
2. All questions carry equal marks.

Q. 1 (a) Design Skin plate thickness and Horizontal Girders for a vertical lift gate having following design data:

1. Clear opening:	3000mm.
2. Centre to centre of seals:	3150mm.
3. Sill level:	100.00m.
4. Top of opening:	103.00m.
5. Top seal level:	103.10m.
6. Full reservoir level:	120.00m.
7. Maximum Water Level:	125.00m.
8. Top of pier/ Deck Level:	126.00m.

Assume any other required data suitably.

(20)

(b) What is the permissible deflection of gate in following cases:

(5)

1. Fixed wheel crest gates.
2. Gates with top seal on upstream side.

Q. 2 (a) Calculate the water thrust acting on a radial gate for FRL Condition, having following design data:

1. Clear opening:	10.00m.
2. Radius of gate:	16.00 m.
3. Sill level:	100.00m.
4. Trunnion Level	105.00m
5. Full reservoir level:	115.00m.
6. Top of gate	115.30m.
7. Top of pier/ Hoist bridge level	120.00m.
8. Assume any other required data suitably.	

(10)

- (b) Calculated water thrust acting on the above mentioned gated Structure, if it is planned as Sluice gate with Sill Level at 90.00 m with size of the gate remaining same. (10)
- (c) Explain reasons for provision of air vents downstream of control gates. (5)

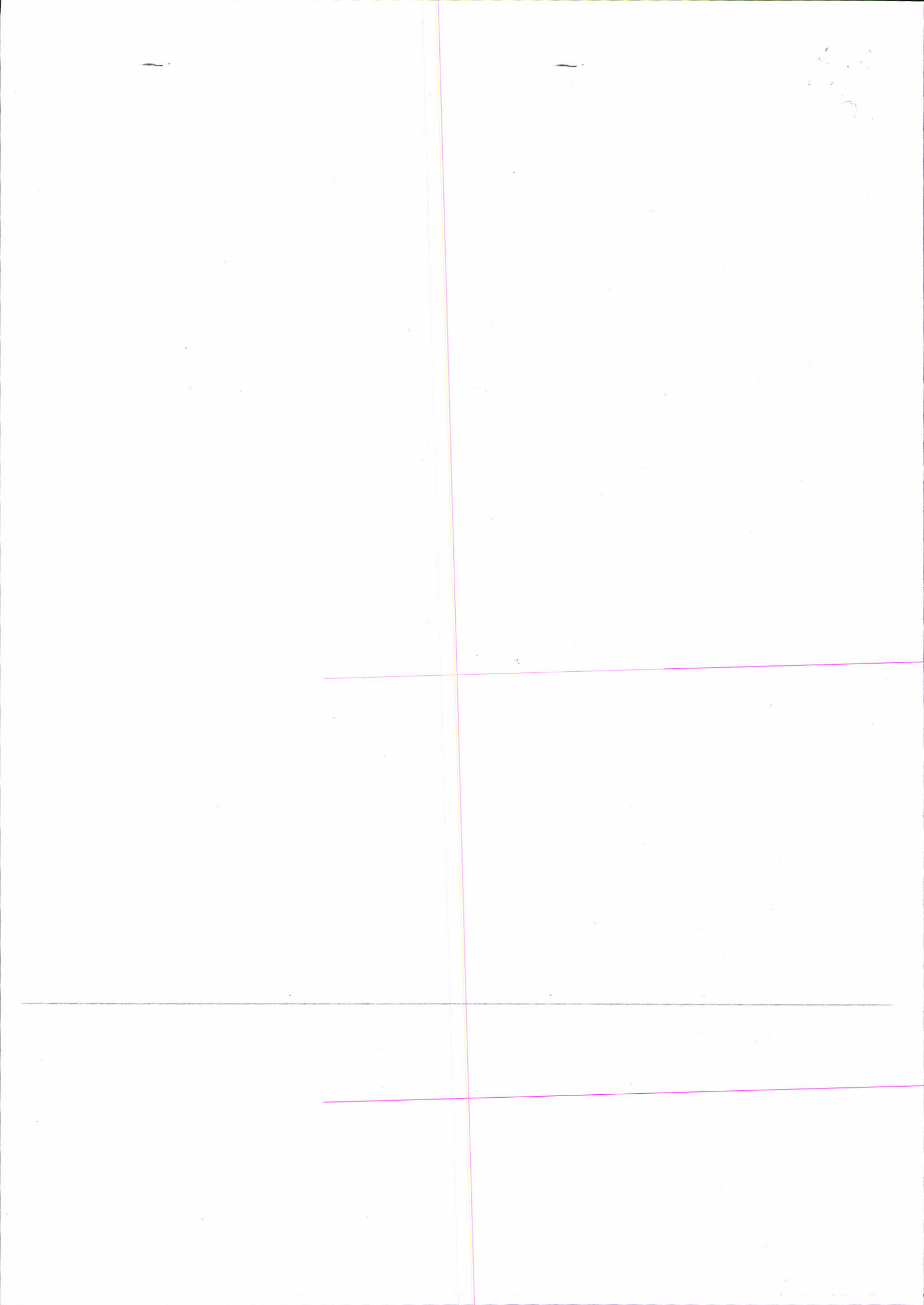
Q3 (a) Draw pressure diagrams and calculate maximum static water loads in Tonnes for a fully closed spillway radial gate and vertical lift sluice gate of water resource project having following salient features:

- i) Full reservoir Level, EL=752.0m
- ii) Crest level of Spillway, EL=732.50m
- iii) Distance between center to center of adjacent piers of spillway overflow section=17.5m
- iv) Pier thickness/width=3.5m
- v) Sill elevation of Radial gate=732m
- vi) Elevation of top of Radial gate (when resting on sill)=752.2m
- vii) Sill elevation of sluice gate=672m
- viii) size of sluice opening=3m X4m

Assume any other required data suitably.

(15)

- (b) Draw typical layout diagram of above gated installation showing sluice gates as well as Radial gate. It may be noted that the sluices are located in overflow section of Spillway? (10)



LIST OF REFERENCES FOR PROFESSIONAL PAPER – II

SECTION – A (~~Select topics awaited~~)

- 1) CWC Publications Available on the CWC web site for Dam safety.
- 2) Guidelines for preparation of DPRs of Irrigation and Multi Purpose Projects (CWC Publication).
- 3) IS Codes: 15662,,IS6955,IS6065,IS13578

SECTION - B

1. Design of Small Dams – An USBR Publication
 2. Design of Barrages & Weirs on permeable foundation – CBIP Pub. No. 179
 3. Irrigation Engineering and Hydraulic structures – S. K. Garg
 4. Design of Irrigation Structures – Varsney & Gupta
 5. Design of Earth & Rockfill Dams – Dr. Bharat Singh
 6. Hydropower structures by R.S. Varshney
 7. Handbook of Hydroelectric Engineering By P.S. Nigam
 8. Water Power Development by Mosonyi E.
 9. Manual on design, fabrication, erection and maintenance of steel penstocks by Central Water Commission.
 10. Practical Rock Engineering by Dr. Evert Hoek – *freely downloadable from www.rocscience.com*
 11. IS codes:
 - 4247 (Part 1, 2 & 3) – Structural Design of surface hydroelectric power stations.
 - 7396 (Part 1, 2, 3 & 4) – Surge Tanks
 - 9761 – Hydropower intakes – criteria for hydraulic Design
 - 11625- Criteria for hydraulic design of penstocks
 - 11639 (Part 1, 2 & 3)- Structural Design of penstocks – criteria.
 - 13365 (Part 2) – Quantitative Classification Systems of Rock Mass - Guidelines
-
- 15026 - Tunneling methods in Rock masses — guidelines
 - IS: 6966 – Hydraulic Design of Barrages and Weirs
 - IS: 6512 - Criteria for Design of Solid Gravity Dam
 - IS: 7784 – Design of Cross Drainage Works

SECTION - C

1	Book	Design of Hydraulic Gates, Paulo C F ERBISTI
2	Book	Hydro Power Structures, Varshney R.S.
3	Book	Handbook of hydroelectric engineering, P S Nigam
4	IS:4622	Recommendations for structural design of Fixed wheel Gates
5	IS:4623	Recommendations for structural design of Radial Gates
6	IS:5620	Recommendations for Structural Design criteria for Low Head Slide Gates
7	IS:9595	Recommendations for metal arc welding of Carbon & Carbon Manganese Steels
8	IS:456	Code of practice for Plain & Reinforced Concrete
9	IS:800	Code of practice for General Construction in Steel
10	IS:6938	Code of practice for Design of Rope Drum & Chain Hoists for Hydraulic Gates
11	IS:1893	Criteria for Earthquake Resistant Design of Structures
12	IS:11855	Guidelines for Design and Use of different types of Rubber Seals for Hydraulic Gates
13	IS:7718	Recommendations for Inspection, Testing & Maintenance of Fixed wheel & Slide Gate
14	IS:14177	Guide lines for painting system for hydraulic gates and hoists.
15	IS: 10210	Criteria for Design of Hydraulic Hoists for Gates
16	IS:15466	Rubber seals for hydraulic gates
17	IS:3177	Electric Overhead Cranes
18	IS:4622	Recommendations for structural design of Fixed Wheel Gates

SAMPLE PAPER

PROFESSIONAL PAPER – 1

Time: 3 hours
Max. Marks: 100

Note: Civil Engineers shall attempt Section A & B. Mechanical Engineers shall attempt Section A & C.

SECTION A

Multiple choice objective type questions

Note: Attempt all questions. Each question is having 1 mark.

1. Pick the TRUE statement in respect of Appraisal of Projects by CWC
 - a. Both Major and Medium Projects are appraised at CWC(HQ)
 - b. Both Major and Medium Projects are appraised at CWC Regional Offices.
 - c. Major Projects are appraised at CWC(HQ) and Medium Projects are appraised at CWC Regional Office
 - d. Major Projects are appraised at CWC Regional Office and Medium Projects are appraised at CWC (HQ)
2. The State Governments are empowered to accord investment approval to:
 - a. All Major and Medium Projects
 - b. All Medium Projects
 - c. Major and Medium Projects not having inter-state ramifications
 - d. Only Medium Projects not having inter-State ramifications
3. The Project Planning, Appraisal and Investment clearance are respectively the responsibility of:
 - a. Planning Commission, State Governments and CWC
 - b. State Governments, Planning Commission and CWC
 - c. MoWR, RD & GR, CWC, State Governments
 - d. State Governments, CWC and Planning Commission
4. What is the criteria for economic evaluation of Irrigation Project?
 - a. Financial Rate of Return
 - b. Internal Rate of Return
 - c. Benefit-Cost Ratio
 - d. Cost per ha
5. Please read the following statements:
 - (a) Flood schemes of Ganga basin are appraised in CWC(HQ)
 - (b) Medium Irrigation schemes are appraised in CWC Regional office

Pick the correct statement from below:

- a. Only (a) is correct
 - b. Only (b) is correct
 - c. Both (a) and (b) are correct
 - d. Both (a) and (b) are incorrect
6. Regulation and Development of Inter-state rivers and river valleys to the extent to which such regulation and development under the control of the union is declared by Parliament by law to be expedient in the public interest is under:
- a. Concurrent list
 - b. State list
 - c. Union list
 - d. None of the above
7. Please read the statement:
- (i) Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the water of, or in, any inter-state river or river valley
 - (ii) Notwithstanding anything in the constitution, Parliament cannot provide by law that neither the supreme court nor any other court shall exercise jurisdiction in respect of any such dispute or complaint as is referred to in (i) above.
- a. Only (i) is true
 - b. Only (ii) is true
 - c. Both (i) and (ii) are true
 - d. Both (i) and (ii) are false
8. Major and Medium Irrigation Projects to be eligible for Central Assistance under AIBP should be
- (i) Having investment clearance from Planning Commission
 - (ii) In advance stage of construction
 - (iii) Can be completed in next 4 financial years
 - (iv) Project should be receiving some other form of assistance
- a. Only (i) is correct
 - b. Only (i) and (ii) are correct
 - c. Only (i), (ii) and (iii) are correct
 - d. All are correct
9. What is the meaning of advance stage of completion?
- a. At least 50% of Physical and Financial Progress
 - b. At least 70% of Physical and 50 % of Financial Progress
 - c. At least 70% of Physical and Financial Progress
 - d. At least 80% of Physical and Financial Progress
10. In the Scheme of RRR of Water Bodies, funding pattern among Centre: State for special category states is :

- a. 60:40
 - b. 70:30
 - c. 80:20
 - d. 90:10
11. RS & GIS techniques are being utilized in which of applications area(s) in Central Water Commission?
- A. Mapping of Glacial bodies and snow melt runoff
 - B. Monitoring of AIBP projects
 - C. Reservoir Sedimentation assessment
 - D. All of the above
12. Which is the nodal agency in India for supplying Remote Sensing data
- A. NRSC, Hyderabad
 - B. SAC, Ahmedabad
 - C. Survey of India, Dehradun
 - D. DST, New Delhi
13. Which is the nodal Ministry for Rehabilitation & Resettlement Policy (R&R policy 2007)
- A. Ministry of Tribal Affairs
 - B. Ministry of Rural Development
 - C. Ministry of Environment & Forest
 - D. Ministry of Water Resources
14. As per National Water Mission for Climate Change the water use efficiency is to be increased by
- A. 20%
 - B. 23%
 - C. 15%
 - D. 30%
15. At what level from the surface of the river current meter is lowered for measuring velocity.
- A. 0.6 d
 - B. 0.8 d
 - C. 0.5 d
 - D. 0.2 d
16. Which data can be entered in the SWDES :
- A. Hydrological, Meteorological, Sediment
 - B. Hydrological, Meteorological

- C. Hydrological, Meteorological, Sediment and Water Quality
D. None of the above.

17. Match the pair of Minimum density of hydrological station networks.

	Type of Region		Range of norms for minimum network (area in sq.km. for one station)
a	Flat regions of temperate Mediterranean and tropical zones	1	5,000 - 20,000+
b	Mountainous regions of temperate, Mediterranean and tropical zones	2	1,000 - 2,500
c	Small mountainous islands with very irregular precipitation & very dense streams	3	300 - 1,000
d	Arid and polar zones	4	140 -300

(Select correct answer)

- (A) a-1, b-2,c-3,d-4
(B) a-2, b-3,c-4,d-1
(C) a-4, b-1,c-2,d-3
(D) a-3, b-4,c-1,d-2

18. WMO recommendations for site selection of a site are :

- I. The general course of the stream should be straight for about 100M upstream and downstream from the site.
II. No flow bypasses the site as subsurface flow.
III. The stream bed is not subject to scour and fill .
IV. The banks are permanent and high enough to contain floods.

- (a) I and II (b) Only IV (c) III and IV (d) I, II, III and IV

19. Echo-sounder instrument is used for

- A. Water depth
B. Velocity
C. Both A&B
D. None of the above

20. Water year is from
- 1st June to 31st May
 - 1st April to 31st March
 - 1st January to 31st December
 - None of the above

Short answer type questions

Note: Attempt any 5 questions. Each question is having 8 marks.

- What is technical feasibility and economic viability of an irrigation project? (4)
 - How are the gross and culturable command area of the project worked out? (4)
- What is the objective of AIBP? (4)
 - Name any four tribunals set-up for adjudication of water disputes (4)
- What are the Roles of ICID and its counterpart in India? (4)
 - What is the role of ICAR-CWC joint panel? (2)
 - What is Entry 56 of List 1 in the Consitution (2)
- What is EIA? (2)
 - Explain EIA process (4)
 - What do you understand by R&R Policy? (2)
- List out RS & GIS application in water resources sector and explain the role of remote sensing data in reservoir sedimentation studies being carried out in CWC ? (4)
 - List out the steps involved in mapping of irrigation infrastructure for AIBP on Bhuvan platform (4)
- List out different methods of discharge observation in a river and explain velocity area method of discharge observation using current meter with the help of boat. (6)
 - List out instrument/equipment used in discharge observation (2)
- In Hydrological Information system (HIS) explain the activities that takes at various levels in CWC (6)
 - List out the different year books brought out under CWC H.O setup (2)

SECTION B

Multiple choice objective type questions

Note: Attempt all questions. Each question is having 1 mark.

1. Which of the following statement / statements is / are correct in respect of an irrigation project?
 - I. The gross command area (GCA) is the total geographical area which can be normally be commanded or serviced from an irrigation project without consideration of water supplies available for irrigation;
 - II. The percentage of total area of normally irrigated crops in a year to the culturable command area (CCA) is termed as intensity of irrigation of the project;
 - III. The percentage of total crop area during a crop year or season to the culturable command area (CCA) is termed as cropping intensity;
 - IV. The cropping intensity in a year may be less than the intensity of irrigation.
 - A. None of the above
 - B. I & II
 - C. I, II & III
 - D. All the above
2. Pick up the correct strategy / strategies for drought management in drought – prone areas from the following:
 - I. Extensive and protective irrigation;
 - II. Adoption of less water consuming crops;
 - III. Deficit irrigation;
 - IV. Intensive and productive irrigation.
 - A. All the above
 - B. I, II & III
 - C. I & II
 - D. I only
3. The working tables are prepared to assess the success rate for different uses by matching availability of water with demand in tabular form for a specified period. The working tables for a project prepared for period of 40 years indicate success in meeting the irrigation demand in 28 years after meeting the drinking water demand in all 40 years. As per the guidelines, the project is success full in respect of meeting:
 - A. both irrigation & drinking water demand

- B. drinking water demand only
- C. irrigation demand only
- D. None

4. For economic evaluation of an irrigation project, the benefit cost ratio is computation of:
- A. Net Annual Benefits / Annual Cost
 - B. Net Annual Benefits / Total Project Cost
 - C. Gross Annual Benefits / Annual Cost
 - D. Gross Annual Benefits / Total Project Cost

5. Pick up the incorrect indicators from the following that has no relevance in performance evaluation study of an irrigation project:
- A. conveyance system performance
 - B. gap in irrigation potential created and utilised
 - C. drainage performance
 - D. None

6. The double mass curve technique is adopted to

- a) find average rainfall of number of years
- b) find number of rain-gauges required
- c) check the consistency of rain-gauge records
- d) estimate missing rainfall data

7. The Muskingum method of flood routing is

- a) form of reservoir routing method
- b) hydraulic routing method
- c) numerical solution of St. Venant equations
- d) hydrologic channel routing method

8. Match the following:

1. Brune's Curve	A. Borland and Millar classification of reservoirs
2. The trap efficiency of the reservoir	B. Methods used to predict sediment distribution in the reservoirs
3. Area increment and Empirical area reduction method	C. Used for estimation of trap efficiency of reservoir
4. Gorge, Hilly region, Flood Plain and Lake	D. Decreases as the life of reservoir increases

9. Ordinates of one hour unit hydrograph of a catchment at one hour intervals are 5, 8, 5, 3 and 1 m³/sec. The catchment area represented by the above unit hydrograph is:

- a) 20 sqkm
- b) 200 sqkm
- c) 7.92 sqkm
- d) cannot be calculated

10. A watershed has an area of 300 ha. Due to a 10 cm rainfall event over the watershed a stream flow is generated at the outlet lasts for 10 hours. Assuming the runoff coefficient as 0.2 for the event, the average stream flow at the outlet of the watershed is:

- a) $1.33 \text{ m}^3/\text{sec}$ b) $16.7 \text{ m}^3/\text{sec}$ c) $100 \text{ m}^3/\text{minute}$ d) $60,000 \text{ m}^3/\text{h}$

Short answer type questions

Note: Attempt any 3 questions. Each question is having 10 marks.

1. The month – wise water demand table of an irrigation project is given below:

Month	Irrigation Demand (MCM)	Drinking Water Demand (MCM)	Industrial Demand (MCM)
June	4.50	2.50	1.25
July	15.60	2.50	1.25
August	12.50	2.50	1.25
September	18.75	2.50	1.25
October	11.40	2.50	1.25
November	13.25	2.50	1.25
December	10.80	2.50	1.25
January	9.20	2.50	1.25
February	8.30	2.50	1.25
March	7.70	2.50	1.25
April	0.00	2.50	1.25
May	0.00	2.50	1.25

Using the above data, compute the following:

- (i) Peak water demand (3)
 - (ii) Considering 10% extra for rush irrigation, find the canal capacity required to meet the peak water demand. (4)
 - (iii) The working tables for meeting the above mentioned month-wise water demand for various purposes with the available yield series of 20 years have been prepared. The working tables indicate 4 nos. of failure years for meeting irrigation demand and 5 nos. of failure years for meeting the industrial demand. Find the success rate for meeting the irrigation and industrial demands. (3)
2. Discuss about the need for conjunctive use of surface and ground water in irrigation planning. Explain briefly any two general strategies, integrating surface and ground water

use for conjunctive use plan. Also, discuss about their advantages and disadvantages in brief.
(4+3+3)

3. Flow measurement of river Betwa at Basoda Gauge & Discharge site yielded following annual flows:

Year	Observed Annual Flows (Mm ³)	Year	Observed Annual Flows (Mm ³)
1970-71	15000	1976-77	15700
1971-72	14500	1977-78	12900
1972-73	11700	1978-79	10500
1973-74	12000	1979-80	16000
1974-75	8500		
1975-76	6500		

The annual withdrawals from the upstream of the gauging site for meeting irrigation, drinking and industrial needs are 100 Mm³ and it is expected to increase by 5 Mm³/year. Estimate 75% yield at Basoda site?

4. The observed flows from a storm of 6-hour duration on a stream with catchment area of 500 km² are as follows. Assuming the base flow to be zero, derive 6-hour unit hydrograph?

Time	0	6	12	18	24	30	36	42	48
Observed Flows (m ³ /sec)	0	100	250	200	150	100	70	50	35
Time	54	60	66	72					
Observed Flows (m ³ /sec)	25	15	5	0					

5. The annual maximum flood peaks are subjected to various tests before using in flood frequency analysis. State such tests and their significance?

6. The average and standard deviation of the annual flood peak series of a river at a station A are 600 m³/sec and 150 m³/sec respectively. Find out 50 year return period flood at station A using Gumbel's method. Consider reduced mean and reduced standard deviation as 0.577 and 1.28 respectively.

7. What is Probable Maximum Precipitation(PMP) and how it is different from Standard Project Storm (SPS)?

SECTION C

Multiple choice objective type questions

Note: Attempt all questions. Each question is having 1 mark.

1. Which one of the following equipment is most suitable for excavating trenches and pits?
 - a) Hydraulic excavator with back hoe attachment
 - b) Hydraulic excavator with front shovel attachment
 - c) Front End loader
 - d) Crawler Tractor

2. Which type of following equipment is most suitable for tunneling or underground excavation works, with Drill & Blast Method.
 - a) Wheeled equipment
 - b) Crawler equipment
 - c) Railed equipment
 - d) Depends on geology of underground strata.

3. For an inter-linking River project, it is proposed to excavate a 30km long link tunnel of 8m dia. for water conveyance in the central region of India. As per the topographical condition no. of audits are restricted to 3 nos. only. Which tunneling method is most suitable in this case?
 - a) Full face drilling & basting by deploying two boom jumbo.
 - b) By deploying tunnel boring machine
 - c) By deploying road header
 - d) Tunneling is not possible

4. Total concrete requirement to construct a RCC dam is about 20,00,000 cum and the concreting of the dam is planned to be completed in 4 working season. River bed concreting requirement is about 6,00,000 cum which is planned to be completed in one working season. Which one of the following concrete placement systems is most suitable in this case?
 - a) 6 no. of Tower crane 20T@50m
 - b) Bi-cable way of bucket capacity 29T
 - c) Conveyer belt system of 300 cum/hr capacity
 - d) 8 no. of 40cum/hr concreting pump.

5. The following operations are generally employed for tunnelling in hard rock.
 1. Removing ingress water
 2. Loading holes and firing the explosive
 3. Setting up and drilling

4. Grouting and lining
5. Removing muck
6. Ventilation and removing explosion dust

The correct sequence is:

- a) 3 2 6 5 1 4
- b) 3 4 6 1 5 2
- c) 4 1 2 3 6 5
- d) 5 4 2 1 3 6

6. Forepoling method is generally adopted for tunnelling in:

- a) Soft strata
- b) Hard strata
- c) Running strata
- d) None of these

7. Pick up the correct statement from the following:

- a) If the float is positive and the activity is delayed by a period equal to its total float, the completion of project is not delayed.
 - b) If the float of an activity is negative, delay in its performance is bound to delay the completion of project.
 - c) If the float of an activity is zero, the activity is critical and any delay in its performance will delay the whole project.
 - d) All the above
- e) Q18. Pick up the correct statement from the following
- f) a) CPM analysis is activity oriented
 - g) b) PERT analysis is event oriented
 - h) c) In CPM, the time is related to cost
 - i) d) All the above

8. Which one is the most suitable combination of loading and hauling equipment for muck deposal in respect of their size and capacity?

- j) a) 1.0 cum hydraulic excavator with 25T rear dumper
- k) b) 2.0 cum hydraulic excavator with 25T rear dumper
- l) c) 1.57 cum hydraulic excavator with 55T rear dumper
- m) d) All the above

9. The Book value of an equipment is Rs. 10,00,000 and scrape value is Rs. 1,00,000. The life of same is 10 years/ 10000 hours. Yearly schedule production hours for the equipment are taken as 2200hrs. What is the hourly depreciation as per the CWC guidelines?

- a) 50 Rs
- b) 55 Rs
- c) 60 Rs
- d) 65 Rs

10. Ownership costs of equipment involve:

- a) Depreciation, interest on capital , Oil charge
- b) Depreciation, interest on capital , insurance, Labour charge
- c) Depreciation, interest on capital , insurance, repair charges
- d) Depreciation, interest on capital , insurance, storage charges

Short answer type questions

Note: Attempt any 3 questions. Each question is having 10 marks.

1. (i) What are the factors affecting the selection of drilling equipment (5)
 (ii) What is rock bolting? What equipments are generally used for the same activity? (5)
2. (i) What are slip forms and its application? (5)
 (ii) Write short note on collapsible formwork system? (5)
3. (i) Which equipment/methods are used for excavation of pilot shaft/hole? (5)
 (ii) Mention the sequence of operations involved in driving a tunnel in the rock? (5)
4. (i) White a note on hourly use rate? (5)
 (ii) Write down various techniques used for construction scheduling? (5)
5. (i) Bring out some difference between crawler and pneumatic wheel type of undercarriage? (5)
 (ii) Name & describe in brief some compaction equipment? (5)

Central Water Commission
Sample Professional Paper-III
49TH Departmental Exam for CWES Officers

Date:

Time: 3 hrs.....

Maximum Marks: 100

Part A (Multiple choice objective questions)

Question 1. Which of the following is true? (Tick all correct answers) (1)

- (A) The Non Cheque Drawing DDO'S are appointed where the Pay and Accounts office is situated
- (B) Cheque Drawing DDO are appointed where there is no Pay and Accounts office
- (C) The Non Cheque Drawing DDO'S are appointed where there is no Pay and Accounts office
- (D) Cheque Drawing DDO are appointed where the Pay and Accounts office is situated

Question 2. What are functions of Drawing and Disbursing Officer: (1)

- (A) Preparation of budget estimate / revised estimate
- (B) Drawal of money for running of office
- (C) Maintenance of records such as cash book, bill register, etc.
- (D) All of the above

Question 3. TDS (Tax Deducted at Source) report is to be filed to tax authority by DDO at _____ basis. (1)

- (A) Daily
- (B) Weekly
- (C) Monthly
- (D) Quarterly

Question 4. Who maintains the Provident Fund Accounts (except for Group-D staff)? (1)

- (A) Head of Office
- (B) DDO
- (C) PAO
- (D) None of the above

Question 5. A sanction stand lapse when (1)

- (A) No payment has been made against that sanction during 12 Months of issue of sanction.
- (B) After expiring of currency of the period mentioned in sanction
- (C) After the end of financial year mentioned in sanction
- (D) None of the above

Question 6. The Budget consist of (1)

- (A) All the estimated revenue, receipts for the Financial year
- (B) All the estimated expenditure for the Financial year
- (C) All the estimated interest, debit payments etc
- (D) None of above

Question 7. The Mortar Car Advance can be sanctioned to (1)

- (A) Officers drawing Rs. 19350/- or more in the Pay Band
- (B) Officers drawing Rs. 20350/- or wise in the pay Band
- (C) All Gazetted Officers
- (D) All Govt. Servant

Question 8. What are the functions of Audit? (1)

- (A) Whether Govt. money received are duly accounted for and credited to Govt. accounts
- (B) Whether all the items of expenditure incurred are authorized and are in accordance with the prescribed rules and Regulations
- (C) Whether the accounts are complete in all respects
- (D) All of the above

Question 9. If a vehicle is to be condemned, then certificate from which of the following authority is required? (1)

- (A) Electrical or Mechanical workshop of the National Airports Authority
- (B) Workshop of a State Road Transport Corporation
- (C) Certificate from both (A) and (B)
- (D) Either Certificate from (A) or Certificate from (B)

Question 10. Which of the following(s) are covered under SR (Supplementary Rules)? (1)

- (A) Pay
- (B) Retirement
- (C) Travelling allowance

(D) Government residence license fees

Question 11. Works shall not commence until: (1)

- (A) Administrative approval has been obtained from the appropriate authority in each case
- (B) Sanction to incur expenditure has been obtained from the competent authority
- (C) Work has been financially sanctioned
- (D) All of the above

Question 12. What is the limit for purchase of goods without inviting quotations or bids on the basis of a certificate by the competent authority? (1)

- (A) Rs 1,500
- (B) Rs 15,000
- (C) Rs 1,50,000
- (D) Rs 3,00,000

Question 13. Which of the following hosts the specifications, prices and other salient details of different rate contracted items, and appropriately updates the same: (1)

- (A) Ministry of Finance
- (B) Central Purchase Organization (DGS&D)
- (C) Respective Ministry
- (D) None of the above

Question 14. In which of the following cases, restricted tenders can be called? (1)

- (A) The work is required to be executed with very great speed which not all contractors are in a position to generate
- (B) Where the work is of secret nature and public announcement is not desirable
- (C) Maintenance of VIP residences/important buildings as decided by Chief Engineer concerned
- (D) All of the above

Question 15. What is the time limit between the date of publication and date of receipt of the tenders for tenders costing 20 lacs to 2 crores (except global tenders)? (1)

- (A) 7 days
- (B) 10 days
- (C) 14 days

(D) 30 days

Question 16. Surplus or unutilized tender documents are: (1)

- (A) Kept safely for future
- (B) Transferred to higher authority
- (C) Destroyed
- (D) None of the above

Question 17. Which of the following(s) is(are) true: (tick all correct answers) (1)

- (A) When two or more persons have a common intention communicated to each other, to create some obligation between, there is said to be an "Agreement"
- (B) When two or more persons have a common intention communicated to each other, to create some obligation between, there is said to be a "Contract"
- (C) An agreement which is enforceable by law is a "Contract"
- (D) A contract which is enforceable by law is an "Agreement"

Question 18. Who is the disciplinary Authority in the case of group-A officer (1)

- (A) Chairman, CWC
- (B) Secretary, MoWR
- (C) Minister, Water Resources, River Development and Ganga Rejuvenation
- (D) The President of India

Question 19. What are the ways in which a complaint can be dealt with (1)

- (A) To file it without investigation
- (B) To pass it to CBI
- (C) To pass it concerned administrative authority to take appropriate action
- (D) To take up detailed investigation by vigilance

Question 20. What is the purpose of Preliminary investigation (1)

- (A) To check the veracity of the complaint
- (B) To find out detailed investigation
- (C) Both A & B
- (D) None of above

Question 21. A govt. officer has purchased a car for Rs. 5.0 lakh in the name of his spouse (1)

- (A) He is required to intimate the department
- (B) He is not required to intimate the department as it is in his spouse name
- (C) The purchase is below the monetary limit prescribed under CCS conduct rule
- (D) None of above

Question 22. The TA advance can be sanctioned by (1)

- (A) Head of department
- (B) Controlling officer
- (C) Head of Office
- (D) None of above

Question 23. The TA claim is to be submitted within _____ when the TA advance has been taken (1)

- (A) 15 days
- (B) 10 days
- (C) 30 days
- (D) 90 days

Question 24. The physical verification of T&P account is to be carried out (1)

- (A) monthly
- (B) Quarterly
- (C) Annually
- (D) Once in 5 year

Question 25. A note should contain (1)

- (A) The matter to be dealt
- (B) The rule position
- (C) The competent Authority to decide the matter/decision to be taken
- (D) All of the above

Question 26. The file number should contain (1)

- (A) Subject code allotted universally
- (B) Any number which suits the office
- (C) Month of opening of file
- (D) Name of the Directorate

Question 27. The reply of starred question is to be approved by _____ within CWC (1)

- (A) Director
- (B) Chief Engineer
- (C) Member
- (D) Chairman

Question 28. In which case the reply on the floor of house has to given orally by respective Minister (1)

- (A) Starred question
- (B) Unstarred question
- (C) bith (A) & (B)
- (D) None of the above

Question 29. Which of the following deals with the sanctioning authority for contingency expenditure (1)

- (A) Schedule I
- (B) Schedule II
- (C) Schedule III
- (D) Schedule V

Question 30. As per delegation of financial powers, who is the Head of office (1)

- (A) Any officer declared so by CE, HRM
- (B) Any Gazetted officer appointed by head of department under DFFR rule no.
- (C) Any officer of the rank of Deputy Director & above
- (D) None of the above

Part B (Short answer type questions 7 marks each)

1. What is general pool residential accommodation? Who is eligible to apply ? Define "Family"? Who is entitled for the CGHS Medical Facilities?
2. What are guidelines for drafting the noting
3. List the various forms used for contracts as per CPWD procedure. Briefly explain the purpose for which the following forms are used.
4. (a) What is "Liquidated Damages" in the context of a Contract?

(b) What are the purposes for which Special Casual Leave may be granted
5. What are the functions of the Disciplinary Authority?
6. Explain the terms.
 - a. Limited Tender Enquiry
 - b. Late bids
 - c. Outsourcing of services
 - d. Purchase of goods without quotation
7. Explain the terms.
 - a. Expression of Interest
 - b. Pre-bid conference
 - c. Forms of security deposit
 - d. Deviations
8. What are Attached and Subordinate Offices?
9. How many types of questions are admissible in the Parliament? Define each.
10. Define the procedure of Inventory management.

Central Water Commission
Sample Professional Paper-III
49TH Departmental Exam for CWES Officers

Reference Material:

1. CPWD work Manual 2012
 2. GFR-2005
 3. Handbook for Inquiry officers and Disciplinary Authorities by DoPT.
 4. FR & SR
 5. Advances to Government Servant Swami's Compilation
 6. Notes on Office procedures by DoPT.
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