

Government of Karnataka
Forest Department

Recruitment examination (main) for Range Forest Officer training 2007

06th November 2007 (2.30pm to 5.30 pm)

Optional paper: CIVIL ENGINEERING

Max. marks: 100

Time: 3 hours

PART-A (Compulsory question)

20 marks

- 1) Select the correct answer from the choices in the following (1 mark each)
- i) Section modulus for a rectangular section is
a) $BD^3/6$ b) $BD^4/3$ c) $BD^2/6$ d) $BD^6/3$
- ii) Cables carry only
a) axial forces b) shear forces
c) bending moments d) axial forces and bending moments
- iii) In the case of riveted joints the minimum pitch should not be less than
a) $5d$ b) $1.5d$ c) 2.5 d) $3.5d$
- iv) A whirlpool in a river is an example of
a) a free vortex
b) a forced vortex
c) a spiral forced vortex
d) a cylindrical forced vortex
- v) Turbid meter using blue cobalt plates is
a) Jackson turbidimeter
b) Bayli's turbidimeter
c) Tube turbidimeter
d) Plate turbidimeter
- vi) The error in the horizontal circle readings due to the line of collimation not being perpendicular to the trunion axis is eliminated by
a. taking the readings on the different parts of the horizontal circle
b. taking readings on both the faces
c. removing the parallax
d. transiting the telescope

vii) Random method of running a line between two points A and B is employed when

- a. A and B are not intervisible even from an intermediate point.
- b. A and B are only intervisible from an intermediate point
- c. The difference of level between the points is large
- d. It is not a method at all for running a line.

viii) The plasticity chart is obtained by plotting

- a. Plasticity index on X-axis and liquid limit on Y-axis
- b. Liquid limit on X-axis and plasticity index on Y-axis
- c. Plastic limit on X-axis and plasticity index on Y-axis
- d. Plasticity index on X-axis and plastic limit on Y-axis

ix) For engineering purposes a soil is defined as

- a. A natural aggregate of mineral grains, loose or moderately cohesive, inorganic or organic in nature
- b. Loose mantle at the surface of the earth which favours the earth, which favours the growth of plants
- c. disintegrated rocks
- d. none of the above

x) The effect of grade on safe overtaking sight distance is

- a. to increase it on descending grades and to decrease it on ascending grades
- b. to decrease it on descending grades and to increase it on ascending grades
- c. to increase it on both descending and ascending grades
- d. to increase it on both descending and ascending grades

2). Answer the following questions in one sentence

(1 mark each)

- i) Define angle of Friction.
- ii) Define normality
- iii) Explain Design periods
- iv) What do you mean by Duty ?
- v) Explain Ripple diagram

3) Fill the appropriate answers in the blanks

(1 mark each)

- i) In the case of pin jointed frames the members carry onlyforce
- ii) The shortest distance between the point of commencement and the point of tangency of a circular curve is known as
- iii) Generally speaking organic soils are..... in colour than inorganic soils
- iv) For perfectly dry sample the degree of saturation is
- v) Vane shear test is used to determine the

PART- B

Answer any **FOUR** full questions

(20 marks each)

- 4 a) Show that the centroid of quadrant of circle is located from the base at $4R/3\pi$... (06)
b) Obtain the relationship between load intensity, shear force and bending moment. ... (06)
c) A fixed beam of span 5m carries a concentrated load of 200 kN at 3m from the left end. If the right end sinks by 10mm. Find the Fixed end moments at supports. Take $I=3 \times 10^8 \text{ mm}^4$ and $E= 200 \text{ kN/mm}^2$ (08)
- 5) a) A plate girder simply supported at ends having a span of 15 m consists of a web plate 700 mm x 12mm and a flange plate 300 mm x 18 mm for each flange. The girder carries an all inclusive load of 45 kN per meter run. Find the size of the weld required for connecting the flange plates to the web plates, near the supports. Use 10 mm fillet welds. Permissible shear stress in the weld equals 110 N/mm^2 ... (08)
b) A three hinged arch of span l and rise h carries a uniformly distributed load of W per unit run over the whole span, show that the horizontal thrust at each support is $wl^2/8h$ (06)
c) Design a circular settling tank unit for a primary treatment of sewage at 12 million liters per day. Assume suitable value of detention period (presuming that trickling filters are to follow the sedimentation tank), and surface loading. ... (06)
- 6) a) Explain the following ... (06)
i) Marshall Flume
ii) Short Circuiting
- b) Find the settling velocity of a discrete particle in water under condition when Reynold's number is less than 0.5. The diameter and specific gravity of the particle is $5 \times 10^{-3} \text{ cm}$ and 2.65 respectively. Water temperature is 20°C (Kinematic viscosity ν of water at $20^\circ\text{C} = 1.010 \times 10^{-2} \text{ cm}^2/\text{Sec}$ (07)
c) Area of one hectare is irrigated through a stream with discharge of $0.03 \text{ m}^3/\text{se}$. Depth of root zone is 1.0m and available moisture holding capacity is 16cm/m. Irrigation water is supplied when 50% of the available moisture is depleted. Water application efficiency is 60%. Determine the storage efficiency. ... (07)

- 7 a) Given the following data in table below, determine the RLs of the point 1 to 6. If an uniform gradient of 1 in 20 starts at point 1 having elevation of 150 m, calculate the height of embankment and depth of cutting at all the points from 1 to 6. ... (08)

Station	Chainage in m	B.S.	I.S.	F.S.	RL in m
B.M.	--	10.110			153.460
1	0		3.250		
2	100		1.100		
3	200	6.890		0.350	
4	300		3.140		
5	400	11.870		3.650	
6	500			5.980	

- b) Derive the fundamental formula for i) stadia tacheometry and ii) tangential tacheometry. ... (08)
- c) What are the common difficulties in setting out simple curves? ... (04)

- 8 a) From the following data prepare the network diagram, decide the completion period and complete the critical path method schedule. ... (08)

Activity Item	Duration in days	Activities immediately	
		preceding	following
A	3	None	B, C
B	2	A	D, E
C	3	A	E
D	5	B	E
E	6	D, C	F, G
F	5	D, E	None
G	4	E	None

- b) Give the details of 1½ bricks wall and 2 bricks wall constructed in English bond ... (04)
- c) Name the different methods of measurement of workability of concrete and explain any two methods briefly. ... (08)
- 9 a) Discuss the importance of Highway drainage. ... (06)
- b) Write the comparative statement between flat footed rails and double headed rails ... (04)
- c) From the three phase diagram explain the following
i. porosity, ii. Degree of saturation, iii. Void ratio, iv. Bulk density ... (04)
- d) Explain Columb's failure theory for shear strength of the soil and mention its limitations. ... (06)

