Dept. of Water Resources

College of Engineering

University Baghdad

August 13, 2015

Time: 3Hrs

Closed Book

Admission Examination

NOTE: For questions 1 through 36 circle the most correct answer (or answers) [*2 points per question*] and for questions 37 through 43 give a short and condensed analysis [*4 points per question*].

1. The water duty = 1500 G mishara/1m^3/sec., application efficiency is 90%. The water duty in G m^3/sec/1N hectar is:

    a. 0.0034   **b.** 0.00296   **c.** 0.0027   **d.** 0.00068   **e.** None of these

2. An irrigated field, the supply stream is 40 lps , time of irrigation is 24 hrs, and the area of the field is 40 misharas. The net depth of application in this area is _____ mm :

    a. 35   **b.** 40   **c.** 80   **d.** 100   **e.** None of these.

3. The recommended longitudinal slope of a field drain is _____ cm/km

    a. 25   **b.** 30   **c.** 100   **d.** 50   **e.** None of these.

4. The design of an irrigation and drainage network requires the contour map of the scale .... or less.

    a. 1:50000   **b.** 1:25000   **c.** 1:10000   **d.** 125000   **e.** None of these

5. Kostiakov's equation to calculate the cumulative depth of infiltration is $D = f(t) = c\, T^b$. The instantaneous infiltration function would be: **a.** $I_{inst} = D\, dt$

    b. $I_{inst} = D/T$ **c.** $I_{inst} = D * T$

    d. $I_{inst} = dD/dT$ **e.** none of these

6. Given a crop consumptive use rate of 9 mm/day, an irrigation efficiency of 72% and the cultivated area is 80% of the gross area: this is equivalent to a water duty of: **a.** 1.04 gross lps/gross hectare   **b.** 1.45 gross lps/net hectare   **c.** 1.45 total lps/gross hectare   **d.** 1.04 net lps/gross hectare   **e.** none of these

7. A traveler irrigator moves along a 100 – m wide field with a speed of 0.8 m/minutes. Its discharge is 48 m^3/hr. The gross depth of application (in mm) would be: **a.** 10 **b.** 0.384   **c.** 600   **d.** 60   **e.** none of these

8. If soil moisture deficit is 150mm, readily available water is 120mm, then required net depth of irrigation to have full irrigation will be: **a.** 120mm, **b.** 30mm **c.** 150mm **d.** 130 mm   **e.** none of these.

9. If gross Intermittent discharge = 0.1 liter/sec, time of irrigation =12 hrs. every 2 days. Net irrigation area = 5 hectare. Water Duty will be: **a.** $12m^3/min/1$ N.m^2. **b.** 0.2 m^3/sec/1 N. m^2. , **c.** 0.005 liter/sec/1 N.ha.

   d. 0.003 liter/sec/1 N.ha **e.** none of these.

10. If maximum irrigation Interval = 10days, ET =7mm/day, IE = 90%. Deep percolation will be (assume full irrigation): **a.** 7.8mm **b.** 8.7mm **c.** 7.0mm **d.** 6.5 mm **e.** none of these.

11. The best hydraulic section occurs when:

   a. the energy is minimum **b.** the hydraulic radius is minimum for a given area **c.** the specific energy is minimum **d.** the wetted perimeter is minimum for a given area **e.** none of these

12. Water drains from a pressurized tank through a pipe system as shown in the below Figure. The head of the turbine is equal to 116 m. If entrance effects are negligible, the flow rate is_____ m^3/s :
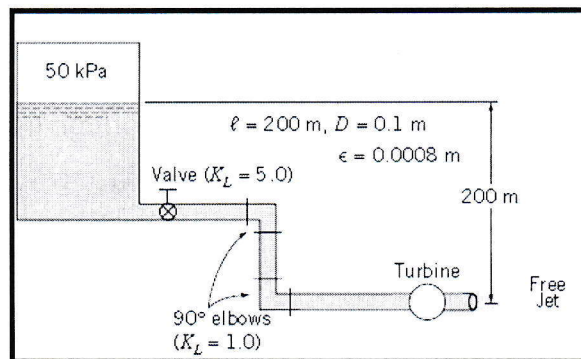
a. 0.04 **b.** 0.01 **c.** 0.65 **d.** 1.1 **e.** None of these

13. A 6 cm diameter orifice is discharging water under a head of 9m, if coefficients of velocity and discharge are 0.6 then the actual discharge in l/ sec is: **a.**225.6 **b.**37.6 **c.** 22.56 **d.** 376 **e.** none of these

14. Crude oil at 20 ^{0}C (μ= 71.8*10^{-4} Pa.s.) fills the space between two concentric cylinders 250mm high and diameters of 150mm and 156mm. **What torque (T), in N.m is required to rotate the inner cylinder at 12 r/min, the outer cylinder remaining stationary?**
   a. 7.5*10^{-5} **b.** 0.02 **c.** 1.5*10^{-4} **d.**0.04 **e.** none of these

15. Reynolds number is the ratio of inertia force to the _____ force.
   a. Pressure **b.** Inertia **c.** Gravity **d.** Shear **e.** none of these

16. For the head regulator, the most severe condition of uplift pressure on the floor occurs when:
   a. the flow in the river is at flood level and canal is running at full supply depth.
   b. the canal runs dry and the river flow is at high flood level.
   c. the canal runs at full supply depth and the river flow is at pond level.
   d. the canal runs dry and the river flow is at pond flood level.
   e. None of these

17. In flow under a gate, the D/S influence occurs when the ………..
    a. D/S level is less than the gate opening.   b. D/S level equals the gate opening.
    c. D/S level exceeds the depth of flow under the gate.   d. All of the above.
    e. None of the above.

18. If a vertical line is drawn on the specific energy curve, corresponding to a particular value of specific energy, then the two depth values are obtained, which are known as:-
    a. initial and sequent depths.   b. alternate depths   c. Conjugate depths.   d. all of these   e. None of these

19. The head loss in turbulent flow in a pipe, culvert or siphon: f
    a. varies directly as the velocity. b. varies inversely as the square of the velocity.
    c. varies inversely as the square of the diameter .
    d. varies approximately as the square of the velocity. e. None of these

20. According to Khosla's theory, the critical hydraulic gradient for alluvial soils is approximately:
    a. 1.0   b. 1.5   c. 2.0   d. 0.5   e. None of these

21. A double mass analysis is made:
    a. To find the missing rainfall at a station in a particular area.
    b. To detect any change in exposure of a station.
    c. To adjust the record at a station to the changed environment.
    d. To compute the average annual rainfall consistent with changed environment.
    e. All of the above.

22. Flood routing determines outflow hydrograph at any downstream section with the known:
    a. Flood storage
    b. Inflow Hydrograph.
    c. Sediment load in flow
    d. Rainfall intensity.
    e. None of these.

23. In the forest areas, during rainfall the major water loss is due to
    a. Streamflow.
    b. Evapotranspiration.
    c. Infiltaration.
    d. Interception.
    e. None of these

24. In log-Pearson type III distribution , the factor "K" is determine on the base of:
    a. Coefficient of skewness and return period.
    b. Return period and mode.
    c. Coefficient of variation and standard deviation.
    d. mode
    e. None of the above.

25. $\frac{\partial}{\partial x}[x^2y + y\ sin(y)] =$ _____ .

    a. 2xy+ysin(y)   **b.** 2xy   **c.** 2x+1   **d.** 2x+sin(y)   **e.** None of these

26. The series $\sum_{n=1}^{\infty}\frac{1}{n}$ is called _____ series.
    a. Harmonic   **b.** arithmetic   **c.** geometric   **d.** power   e) None of these

27. The Lapalce transform of $\frac{sin(t)}{t}$ is:

    a. $\frac{tan(s)}{s}$ **b.** $tan^{-1}(1/s)$ **c.** $s\ tan^{-1}(1/s)$ **d.** $s^2\ tan^{-1}(1/s)$ **e.** None of these

28. Given $y = sin^2\theta$ **a.** the domain of the function is $0 < \theta < \infty$ **b.** the range of the function is $-1 < y < 1$ **c.** $\frac{dy}{d\theta} = sin\ 2\theta$

    d. $\frac{dy}{d\theta} = 2\ sin\ \theta$ **e.** none of these

29. The salvage value is: _____
    a. The present worth of all future worth.   **b.** The rate of profits in the future.
    c. The reused value.   **d.** The worth property as shown on the accounting records of the company.   **e.** None of these

30. The explicit rate of return for an investment of 10,000 ID ,and the net profits before taxes 1,000 ID is :
    a.9,000   **b.** 9.0%   **c.** 100.0   **d.** 10%   **e.** None of these

31. The t-test is:
    a. A test of variance.   **b.** A test of goodness fit.   **c.** A test about mean.
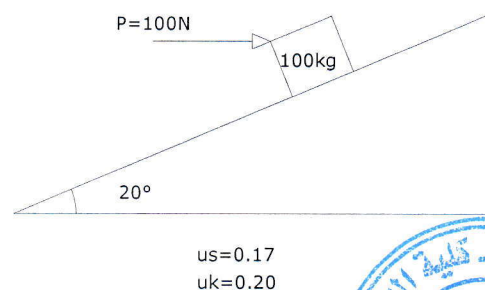   **d.** A test of normalization.   **e.** None of these

32. Given the following set of data:
    $\sum_{i=1}^{17} = 507.62$, the variance = 41.16, the coefficient of variation is
    a. 72.5%   **b.** 29.86%   **c.** 21.49%   **d.** 55.2%   **e.** None of these

33. The block shown will move :
    a. upward   **b.** remain at rest   **c.** slip down the plane   **d.** None of these

P=100N

100kg

20°

us=0.17
uk=0.20

ه_٤

V shape narrow valley is suitable for:
   a. Rockfill dam   b. Arch dam   c. Overflow concrete dam   d. earth dam
   e. None of these

35. A berm on the downstream slope of an earth dam serves to: a. increase slope stability
   b. provide a roadway   c. reduce surface erosion   d. all of the above   e.
   none of these

36. If the eccentricity of the resultant falls outside the middle third, the failure of the dam occurs by:
         a. tension   b. crushing   c. sliding   d. overturning   e. all of them.

37. A spherical buoy has a diameter of 1.5 m, weighs 8.50 kN, and is anchored to the sea floor with a cable. Although the buoy normally floats on the surface, at certain times the water depth increases so that the buoy is completely immersed as illustrated. Find the tension of the cable.

38. Find $\int \dfrac{sin^2\theta}{\cos\theta}\, d\theta$

39. Evaluate: $\displaystyle\int_{0}^{\infty} e^{-u}\,\dfrac{1-\cos(u)}{u}\, du$

40. Solve the following differential equation: $\dfrac{dx}{dt} = \dfrac{x^2 + t\sqrt{t^2 + x^2}}{tx}$

41. Test on a single centrifugal pump running at a constant speed gave the following results:

Q, l/min	0	225	455	680	910	1135
H, m	12.7	12.5	11.9	10.4	7.3	3.7
η, %	0	48	68	76	70	50

Two such pumps are installed in parallel with common suction and delivery pipes with useful of 6.4 m. The friction and other losses external to the pipe are calculated as 2.02 $*10^{-6}Q(l/min)$, calculate the delivery and the input power when two pumps are working in parallel.

42. Water flows at 0.20 m³/s through a 300-mm diameter, 120-m long pipe, under a pressure difference of 280 mm Hg. Find the friction factor of the pipe.

43. Prove that $P_{ww} = \dfrac{P_w}{1+ P_w}$ where P_{ww} = moisture content based on wet weight and
P_w = soil moisture content based on dry weight