

- (b) What do you understand by term governing of turbine? Explain governing mechanism for Pelton wheel.

4. Attempt any *one* part of the following:

10 x 1 = 10

- (a) Discuss the various characteristic curves of hydraulic turbines in detail.
(b) A reaction turbine is revolving at a speed of 200 R.P.M. and develops 5886 kW S.P. when working under a head of 200 m with an overall efficiency of 80%. Determine unit speed, unit discharge and unit power. The speed ratio for the turbine is given as 0.48. Find the speed, Discharge and Power when this turbine is working under a head of 150 m.

5. Attempt any *one* part of the following:

10 x 1 = 10

- (a) Classify Hydraulic turbines in detail.
(b) Determine the overall efficiency of a Kaplan turbine developing 2850 kW under a head of 5.2 m. It is provided with a draft tube with its inlet (diameter 3m) set 1.8 m above the tail race level. A vacuum gauge connected to the draft tube indicates a reading of 5.2 m of water. Assume draft tube efficiency as 75%.

6. Attempt any *one* part of the following:

10 x 1 = 10

- (a) A centrifugal pump with 1.2 m diameter runs at 200 rpm and discharges 1900 liters water per second, the average lift being 6 m. The angle which the vanes make at exit with the tangent to the impeller is 26° and the radial velocity of flow is 2.5 m/s. The inner diameter of the impeller is 0.6 m. Determine: The power required to drive the pump, the manometric efficiency and the minimum rpm to start pumping against a head of 6 m.
(b) What is priming in centrifugal pump? Why it is done? What is self-priming pump? Explain.

7. Attempt any *one* part of the following:

10 x 1 = 10

- (a) What do you understand by an indicator diagram? Explain ideal indicator diagram.
(b) A single acting reciprocating pump of 12 cm diameter and 24 cm stroke is delivering water to the tank which is 10 m above the center of pump. The pump is located 5 m above the center of sump. The diameter and the length of the suction pipe are 5 cm and 5 m respectively, and diameter and length of delivery pipe are 4 cm and 20 m respectively. Find the maximum speed of the pump to avoid separation either in suction pipe or delivery pipe. Take atmospheric pressure head 10.33 m of water and separation occurs at 80 kN/m^2 below atmospheric pressure.

B TECH
(SEM VI) THEORY EXAMINATION 2017-18
ADVANCED FOUNDATION DESIGN

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

- a. What is contact pressure?
- b. What do you understand by geostatic stresses?
- c. Define net safe bearing capacity.
- d. Write the effect of water table on the bearing capacity of the soil.
- e. Define the 'group efficiency factor' of a pile group and list the factors influencing the efficiency of a pile group.
- f. What are the different shapes of wells?
- g. If an expansive soil is susceptible to wetting, what preventive measures would you take?
- h. What is swell pressure?
- i. What is meant by vibration isolation?
- j. What are the assumptions that are generally made in the analysis of the stability of slope?

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

- a. A long flexible strip footing of 2.5 m width having a smooth base is subjected to a uniformly distributed load of 80 KN/m run. Determine the vertical stress intensities at a depth of 2 m below a line parallel to the centre line of the footing at a distance of 3 m from it.
Also draw a Newmark's influence chart on the basis of Boussinesq's equation, for an influence factor of 0.005.
- b. Differentiate between the general shear failure and the local shear failure. How the ultimate bearing capacity in local shear is determined?
- c. A precast concrete pile (35 cm x 35 cm) is driven by a single acting steam hammer. Estimate the allowable load using (a) Engineering News Record Formula (F.S. = 6), (b). Hiley Formula (F.S.= 4), (c) Danish formula (F.S. = 4).
Use the following data:

Maximum Rated Energy	= 3500 KN-cm
Weight of Hammer	= 35 KN
Length of pile	= 15 m
Efficiency of Hammer	= 0.8
Coefficient of resititution	= 0.5
Weight of pile cap	= 3 KN
No. of blows for last 25.4 mm	= 6
- d. Explain the terms used in well foundations; Well Curb, Cutting Edge and Bottom Plug. Also discuss the various methods for rectification of Tilts in the well foundation.
- e. What is a stability number? What is its utility in the analysis of stability of slopes? Discuss the uses of stability charts.

SECTION C

(92)

10 x 1 = 10

3. Attempt any one part of the following:

- (a) Explain how will you modify, the Newmark's equation based on Boussinesq's analysis for vertical pressure below a corner of uniformly loaded rectangular area when the point at which vertical pressure is required is not located below a corner but below some other point of the rectangle.
- (b) Show the expressions for the Westergaard's solution for the vertical stress due to a point load, for a line load of finite length, due to a rectangularly loaded area and due to a circularly loaded area.

10 x 1 = 10

4. Attempt any one part of the following:

- (a) A rectangular footing has a size of 1.8m x 3m has to transmit the load of a column at a depth of 1.5m. Calculate the safe load which the footing can carry at a factor of safety of 3 against shear failure. Use IS code method. The soil has following properties: Porosity, $n = 40\%$; Specific Gravity, $G = 2.67$; water content, $w = 15\%$; Cohesion, $c = 8 \text{ kN/m}^2$; Angle of shearing resistance $\phi = 32^\circ$; For $\phi = 32^\circ$, $N_c = 36$; $N_q = 23$ and $N_\gamma = 30$.
- (b) A 30 cm square bearing plate settles by 8mm in the plate load test on cohesionless soil, when the intensity of loading is 180 kN/m^2 . Estimate the settlement of a shallow foundation of 1.6 m square under the same intensity of loading.

10 x 1 = 10

5. Attempt any one part of the following:

- (a) It is proposed to provide pile foundation for a heavy column; the pile group consisting of 4 piles, placed at 2 m center to center, forming a square pattern. The underground soil is clay, having c_u at surface as 60 kN/m^2 and at depth 10m, as 100 kN/m^2 . Compute the allowable column load on the pile cap, if the piles are circular having diameters 0.5 m each and length as 10 m.
- (b) What are the conditions where a pile foundation is more suitable than a shallow foundation? Discuss different methods for the installation of piles.

6. Attempt any one part of the following:

10 x 1 = 10

- (a) Discuss about the under-reamed piles, and where these piles are to be used? Which method will you use for the design of shallow and deep foundations for the expansive soils?
- (b) A drilled pier of length 5 m is constructed in an expansive soil having the depth of active zone as 3 m. If the shaft diameter is 1 m and the bulb diameter is 1.25 m, calculate the factor of safety (a) without considering dead load (b) with a dead load of 300 kN on the pier.

7. Attempt any one part of the following:

10 x 1 = 10

- (a) Derive an expression for the factor of safety of an infinite slope in a cohesionless soil. What is the effect of steady seepage parallel to the slope on the stability?
- (b) In a test block of the size 1.5 m x 1.0 m x 0.75 m, resonance occurs at a frequency of 20 cycles per second in the vertical vibration. Determine the coefficients of elastic uniform compression (C_u) if the mass of oscillator is 70 kg and the force produced by it at 15 cycles per second is 1000 N. Also compute the maximum amplitude at 15 cycles per second

B TECH
(SEM VI) THEORY EXAMINATION 2017-18
DIGITAL COMMUNICATION

Time: 3 Hours

Total Marks: 100

- Note: 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Any special paper specific instruction.

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

- a. What is base band and pass band signaling?
- b. Define linear time invariant system?
- c. Differentiate between wide sense stationary and strict sense stationary random process?
- d. For error free communication over a channel how channel capacity and entropies are being related?
- e. Compare the probability of error for ASK and BPSK modulation technique?
- f. Define the term processing gain?
- g. Sketch 1110010 waveform by using Manchester and NRZ(L) line coding scheme?
- h. What is slow and fast frequency hopping technique?
- i. How source coding is different to that of channel coding?
- j. What is AWGN channel?

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

- a. What is differential encoding? With suitable diagram explain DPSK modulator and demodulator?
- b. What is ISI? Explain how ISI can be removed by employing a raised cosine filter?
- c. Write down the characteristics and necessity of source coding in communication system? Consider a source with 03 messages having symbol probabilities 0.5, 0.4, 0.1. Obtain Shannon Fano code and calculate its coding efficiency?
- d. Differentiate between random variable and random process? A random variable has an exponential probability density function given by $f(x) = ae^{-b|x|}$ where a and b are constant. Find the relationship between a and b?
- e. A rate 1/3 convolutional encoder has generator matrix $g_1 = 100, g_2 = 111, g_3 = 101$
 - i. Sketch the encoder
 - ii. Draw the code tree and trellis
 - iii. If input is 10110 determine the output?
- f. What is coherent and non-coherent reception technique? With a suitable detailed block diagram explain coherent digital receiver?

SECTION C

3. Attempt any one part of the following:

10 x 1 = 10

- (a) With suitable diagram describe matched filter? Prove that output signal of a matched filter is proportional to a shifted version of the autocorrelation function of the input signal to which filter is matched?
- (b) What is the relevance of M-ary signaling? Explain M-ary PSK modulation

technique and draw its constellation diagram?

10 x 1 = 10

4. Attempt any one part of the following:

- (a) Write short note on
 - i. Gaussian random variable
 - ii. Power spectral density for wide sense stationary random process
- (b) Explain how spread using CDMA technique can use spectrum communication for providing multipoint connectivity?

10 x 1 = 10

5. Attempt any one part of the following:

- (a) What is mutual information and how it is related to channel capacity. For a standard voice band communication channel the signal to noise ratio is 30dB and transmission bandwidth is 3KHz. What will be the Shannon limit for information in bits/sec?
- (b) An information source produces 8 different symbols with probability 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256 respectively. These symbols are encoded as 000, 001, 010, 011, 100, 110 and 111 respectively.
 - i. What is the amount of information per symbol?
 - ii. What is the probability of occurrence for 0 and 1?
 - iii. What is the efficiency of the obtained code?

10 x 1 = 10

6. Attempt any one part of the following:

- (a) Define the entropy? Prove the relationship between different entropies $H(XY) = H(Y/X) + H(X)$
- (b) Design a block code with a minimum distance of three and a message block of eight bits?

10 x 1 = 10

7. Attempt any one part of the following:

- (a) What is Minimum Shift Keying Modulation (MSK) technique? Write down the difference between QPSK and MSK?
- (b) A P-N sequence is generated by using a feedback shift register of length four. Find the generated output sequence if the initial contents of the shift register are 1000. If the chip rate is 10^7 chip/sec. Calculate the chip and P-N sequence duration and period of output sequence?

clock

