B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Structural Analysis-II

P. Pages : 4 **AHK/KW/19/2167**

Time : Three Hours Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Use of non programmable calculator is permitted.

1. Analyse the frame shown in fig. 1 using Kani's method and draw its BMD. **14**

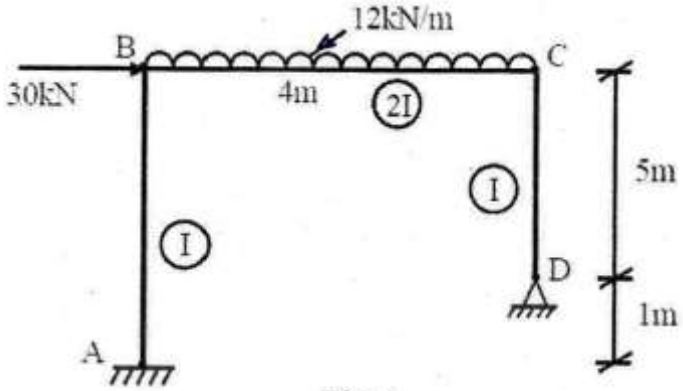

Fig. 1

OR

2. Analyse the frame shown in fig. 2 and draw its BMD. Use Kani's method. **14**

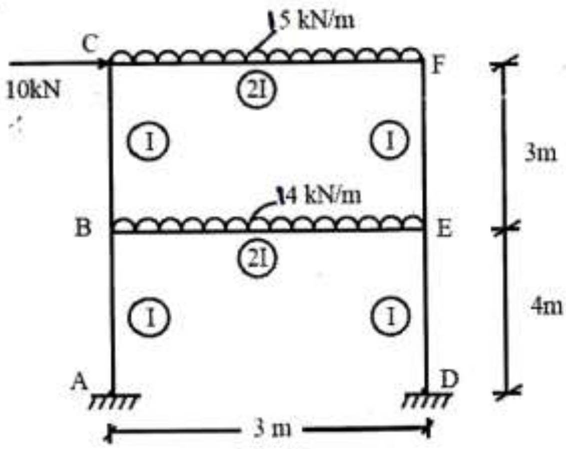

Fig. 2

3. Analyse the continuous beam by moment distribution method. Also draw BMD. Refer Fig. 3 **13**

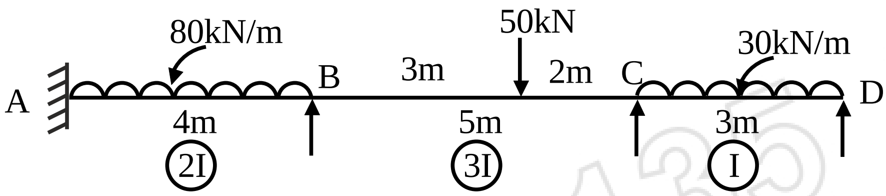

Fig. 3

OR

4. Analyse the frame by moment distribution method as shown in fig. 4. Draw BMD. **13**

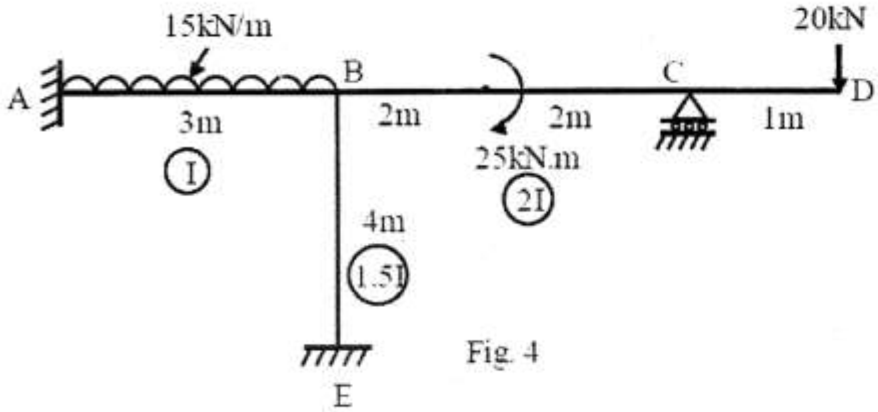

Fig. 4

5. Find member forces for the plane truss shown in fig. 5. Member BC is too long by 3 mm. Use stiffness method. c/s area of all members is 600 mm^2. Assume E = 200 GPa. **13**

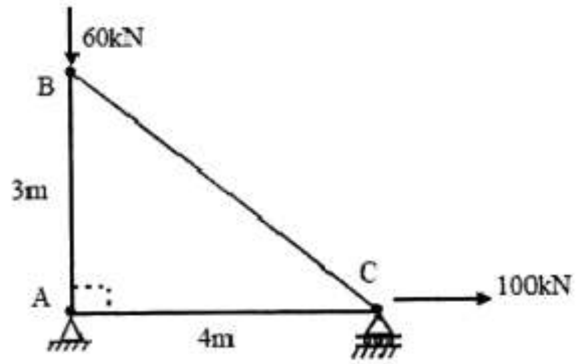

Fig.5

OR

6. Assemble the global stiffness matrix and load matrix for the plane Truss shown in fig. 6 if members meeting at joint B are subjected to temperature rise of 60ºC. **13**
Assume E=210 kN/mm^2. C/S area of members
AB = BC = CD = 710 mm^2 & AC = BD = 550 mm^2.

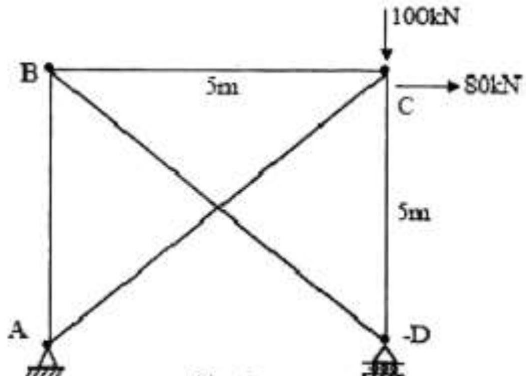

Fig - 6

7. a) Derive member stiffness matrix for a prismatic plane beam element. **7**

b) Derive rotation transformation matrix for a plane beam element. **6**

OR

8. Assemble global displacement matrix for the plane beam loaded as shown in fig. 7 using stiffness method. **13**

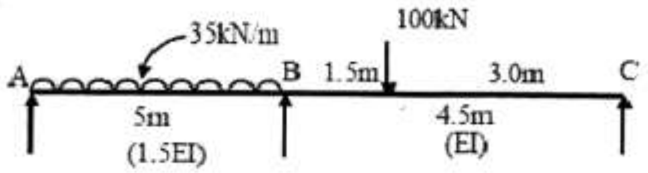

Fig.7

9. Analyse the plane frame shown in fig. 8 by stiffness method. Take E= 25.5 x 10^6 kN/m^2. Size of member 230 x 450 mm. **14**

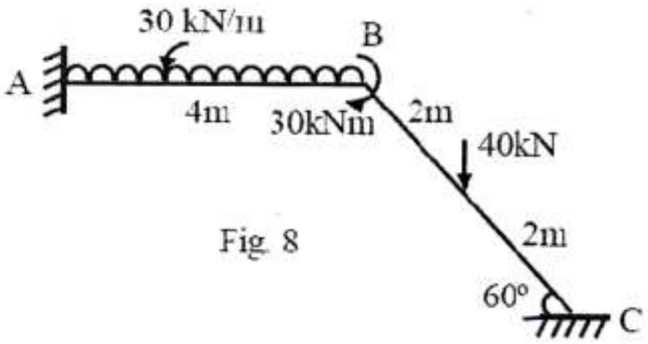

Fig. 8

OR

10. Derive the member force vectors for the plane frame shown in fig. 9. Take E = 25 x 10^3 N/mm^2 and member cross-section as 200 x 400 mm. Use stiffness method and neglect axial deformation. **14**

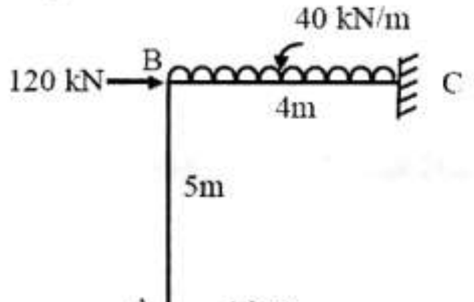

Fig.9

11. Using principle of minimum potential energy. Find out tip displacement for tapered bar as in fig. 10. Take E = 2 x 10^5 MPa. **13**

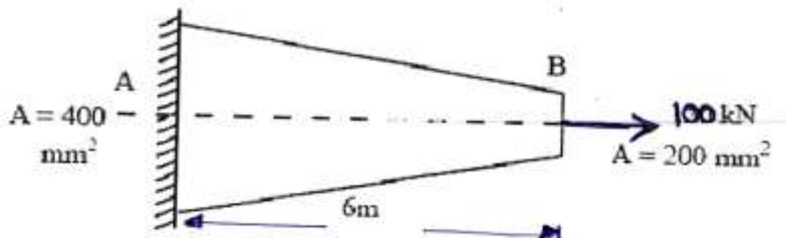

Fig: 10

OR

12. a) Define **any three.** **6**

i) Free vibration ii) Forced vibration

iii) Natural frequency iv) Period of vibration

b) A 0.5 kg mass attached at the end of a light spring elongates it by 1.5 mm. Find the stiffness and natural frequency of the system. **7**

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B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Reinforced Cement Concrete (R.C.C.) Structures

P. Pages : 2 **AHK/KW/19/2168**

Time : Four Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
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5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.
11. IS 456-2000 is permitted.

1. a) Derive design constant [k, j & R] for neutral axis, lever arm and moment of resistance for singly reinforced beam. Also calculate the values of k, j & R for M20 grade concrete and Fe415 grade of steel. [By WSM]. **8**

b) Explain the advantages and limitation of working stress method over limit state method. **5**

OR

2. a) A RC beam of rectangular section 230mm $\times$ 450mm is reinforced with 4 – 12mmϕ bars provided with an effective cover of 40mm. Calculate moment of Resistance of the section and the maximum uniformly distributed super imposed load excluding self weight of beam, this beam can carry if it is simply supported over a span of 3.5m. Use M20 concrete and Fe415 steel. **8**

b) Explain under reinforced, over-reinforced and balanced section with respect to WSM. **5**

3. a) Explain different types of losses in prestressing system. **7**

b) Explain Pre-tensioning and post tensioning methods of prestressing. **6**

OR

4. Explain with the help of neat sketches any two of the following prestressing system. **13**

i) Freyssinet system. ii) Magnel-Blaton system.

iii) Gifford Udall system.

5. a) Calculate factored moment of Resistance of a Singly Reinforced RCC beam 300mm wide and 600mm deep effective reinforced with 4 $\times$ 20mmϕ bars. Use M 20 concrete & Fe 415 Steel. Find a concentrated load which a beam can support at Centre, if span of beam is 4.0m (LSM). **8**

b) What do you mean by limit state of a structure? Identify various limit states. **5**

OR

6. Calculate the ultimate moment of Resistance of a Doubly Reinforced Rectangular Beam of size 230mm $\times$ 500mm reinforced with 5 $\times$ 20 mmϕ on tension side and 3 $\times$ 20mmϕ on compression side at an effective cover of 50mm on either side. Use M20 concrete & Fe415 steel. **13**

7. a) Determine ultimate Moment of Resistance of a T-Beam with following data. **7**
Flange Width = 1000mm,
Depth of Flange = 100mm,
Effective Depth = 600mm,
Width of Web = 300mm,
Area of steel in Tension = 5 $\times$ 20mm dia.
Use M20 grade concrete and Fe415 steel.

b) An R.C.C. column 3.6 m effective length is required to resist an axial ultimate load of 1600 kN. Design the column using M 20 and Fe 415 steel. Assume unsupported length equals to effective length of column. Provide lateral ties. **6**

OR

8. Design a pad footing for column 400mm $\times$ 600mm carrying an axial load of 1200 kN, SBC of soil is $200\,kN/m^2$. Use M20 concrete and Fe415 steel. Draw a neat reinforcement sketch. **13**

9. a) Explain causes and control of cracking in concrete due to loading temperature and Shrinkage. **6**

b) An RC beam has an effective depth of 450mm and a breath of 300mm it contains 6-20mm bars. If fck = 25 N/mm2 and fy = 415 N/mm^2. Calculate the shear reinforcement needed for factored shear force of 400kN, if $2\times20mm\phi$ bars are bent up. **8**

OR

10. Design a rectangular beam section of size 300 $\times$ 500mm size subjected to bending moment of 40 kNm, shear force of 50kN and torsional moment of 30kNm at service condition. Use M20 Grade of concrete and Fe415 steel. **14**

11. Design a simply supported one-way slab over a clear span of 3.5m. It carries a live load of 4 kN/m^2 and floor finish of 1.5kN/m^2. The width of supporting wall is 230mm. Adopt M-20 concrete & Fe-415 steel. **14**

OR

12. Design a Two-way slab for panel size 4.5m $\times$ 6.0m (effective) carrying a live load of 4 kN/m^2 and cement concrete flooring of 20mm thick. The slab is having one short edge discontinuous and all other edges are continuous. Use M 20 Mix & Fe 415 steel. Sketch the reinforcement details. **14**

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B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Fluid Mechanics-I

P. Pages : 2 **AHK/KW/19/2169**

Time : Three Hours Max. Marks : 80

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Notes :
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5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain Newton's law of viscosity and distinguish between Newtonian and Non – Newtonian fluids. **7**

b) The velocity distribution in a viscous flow over a plate is given by $u = 4y - y^2$ for $y <= 2m$. If the coefficient of dynamic viscosity is 1.5 Pa – Sec, determine the shear stress at y = 0 and y = 2.0 m. **7**

OR

2. a) Differentiate **any two**. **6**
i) Ideal Fluid & Real Fluid.
ii) Dynamic viscosity & Kinematic viscosity.
iii) Surface tension & Capillarity.

b) Two points M & N in a pipe system are connected by a differential manometer. Connecting tube is filled with oil (S = 0.85). The high pressure point M is 0.8 m above point N. If the mercury column reading is 8 cm, what is the pressure difference between M & N i) in KPa & ii) in m of water. **8**

3. a) What do you mean by: **6**
i) Absolute pressure. ii) Gauge pressure. iii) Pressure head.

b) An open tank contains water for a depth of 2 m and above it oil for a depth of 1 m. If oil has specify gravity of 0.8, find the pressure intensity at: (i) the interface of the two liquids and (ii) the bottom of the tank. **7**

OR

4. a) Explain the three states of equilibrium for a body partially immersed in liquid. **6**

b) A rectangular plate of size $2m \times 5m$ is immersed vertically in water such that its longer side is parallel to water surface & lies 1.5 m below it. Calculate the magnitude of total pressure and centre of pressure. **7**

5. a) Explain **any two**. **6**
i) Steady flow and unsteady flow.
ii) Laminar flow and Turbulent flow.
iii Stream function and velocity potential.

b) The velocity components in a two dimensional flow field for an incompressible fluid are. **7**

$u = y^3/3 + 2x - x^2.y \quad v = xy^2 - 2y - x^3/3$

Obtain an expression for stream function.

OR

6. a) Derive an expression for continuity equation for a three – dimensional flow. **6**

b) $V = (6 + 2xy + t^2)i - (2xy^2 + 10t)j + 25k$. What is the acceleration and rotation of a particle at (3, 0, 1) at time t = 1 sec.? **7**

7. a) State Bernoulli's theorem, for a steady flow of an incompressible frictionless fluid. What are its limitations? Also write assumptions made in derivation. **6**

b) A venturimeter inclined 30º to the horizontal with 40 cm inlet diameter & 20 cm throat is used for measuring flow of oil (S = 0.9). Differential gauge shows a reading of 5 cm. Assuming $C_d = 0.98$, calculate the discharge. **7**

OR

8. a) Derive an expression for actual discharge of orifice meter. **6**

b) A pipe of 200 mm diameter converging discharge $0.18 m^3/sec$ has a right – angled bend in a horizontal plane. The pressure intensity at inlet of the bend is 290 KPa and at outlet – 280 KPa. Calculate the magnitude and direction exerted by water on bend. **7**

9. a) Define hydraulic coefficients of an orifice & explain the experimental determination of coefficient of velocity. **7**

b) The head of water over an orifice of diameter 10 cm is 7.0 m. The water coming out from the orifice is collected in a circular tank of diameter 2.0 m. Water rises in measuring circular tank by 50 cm in 30 secs. The co – ordinates of point on the jet measured from vena - contracta are 100 cm horizontally and 5.2 cm vertically. Find the values of all the coefficients of the orifice. **7**

OR

10. a) Write short notes: **7**

i) Cipolletti weir.

ii) Error in measurement of head for rectangular Notch.

b) Water approaches a 30 cm long broad crested weir with a head of 0.15 m. The weir has 0.6 m height of water above crest. Taking $C_d = 0.63$, find the maximum discharge considering the velocity of approach. **7**

11. a) Explain in brief the Reynold's experiment to determine the laminar flow . **6**

b) The resistance Torque T against the motion of a shaft in a lubricant bearing depends on the viscosity μ, rotational speed N, diameter D and the bearing pressure intensity p. Show that $T = \mu N D \phi(p/\mu N)$ **7**

OR

12. a) Explain dimensionless numbers. **6**

b) Find the expression for the drag force on smooth sphere of diameter D, moving with a uniform velocity V in a fluid density ρ and dynamic viscosity μ. **7**

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B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Geotechnical Engineering-II

P. Pages : 3 **AHK/KW/19/2170**

Time : Three Hours Max. Marks : 80

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1. All questions carry marks as indicated.
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3. Solve Question 3 OR Questions No. 4.
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8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain standard Penetration Test in detail? **7**

b) Write a short note on- **6**
   a) Objective of field exploration
   b) Types of soil samples & samplers.

OR

2. a) Enlist different methods of soil exploration and explain any one with its limitations? **7**

b) Compute the area ratio of a thin walled tube sampler having internal diameter 55mm & a wall thickness of 2.50mm. Do you recommended this sampler to obtain UDS? Comment? **6**

3. a) Explain 'Frictional circle method'? **6**

b) A 8m high earth dam into be constructed from a soil having an effective angle of internal friction 30º & a cohesive strength of $25 kN/m^2$ with slope 1.5:1, $\alpha_A = 26^\circ$ & $\alpha_B = 35^\circ$ Determine FOS using Swedish circle method. **7**

OR

4. a) Explain Stability Number (S_n) with respect to full reservoir condition & sudden draw down condition. **6**

b) Analyze the infinite slope having slope angle $\ell^\circ = 25^\circ$. If is made of soil having $C = 30 kN/m^2$ $\phi = 20^\circ, e = 0.65$ & $G_S = 2.7$; under the following condition. **7**
   i) When the slope is dry
   ii) When water seeps parallel to the surface of the slope and
   iii) When slope is submerged

5. a) During an excavation in Clayer soil with $y = 20\,kN/m^3$, It caved in after the depth 4m, calculate 'C'. If the same soil is used for backfill upto 8m. Calculate Active earth Pressure (P_a) & passive earth Pressure (P_p). **7**

b) A wall of 8m height retains sand having a density of $1.936\,Mg/m^3$ and an angle of internal friction 34º. If the surface of the backfill slope upward at 15º to the horizontal, Find the active thrust per unit length of wall use Rankines Theory. **7**

OR

6. a) A retaining wall has following details- **7**

i) Height of wall = 6m

ii) Unit wt of soil = $17kN/m^3$

iii) Inclination of face of wall with vertical = 0º

iv) Angle of wall friction = 20º

v) Angle of internal friction = 30º

vi) Inclination of backfill with horizontal = 0º
Compute the total active force on a wall use Rebhan's method.

b) Explain Culmann's graphical method? **7**

7. a) Discuss the functions and applications of geosynthetics in civil Engg. **6**

b) Write a short note on Vibroflotation. **7**

OR

8. a) Explain NPVD, PPVD & Stone columns? **6**

b) Explain with suitable sketch sand drain & their uses? **7**

9. a) Explain various modes of shear failure with suitable sketch & different settlements. **7**

b) A square footing located at a depth of 1.3m below ground level, caries a safe load of 800kN. Find the size of Footing if FOS = 3. **7**
Soil Properties- G = 2.67; e=0.55; S=50% $C = 8\,kN/m^2$; $\phi = 30^\circ$,
$N_c = 37.2$, $N_q = 22.5$, $N_y = 19.7$.

OR

10. a) Explain plate load test with its limitations. **7**

b) A square footing $1.3m \times 1.3m$ is to be founded at a depth 1.2m below ground level. The soil properties are $C = 20\,kN/m^2$; $\phi = 22^{\circ}$ $y = 18\,kN/m^3$, $y_{sat} = 20\,kN/m^3$ **7**

Determine-

i) Net ultimate bearing capacity without water table effect

ii) Change in the net ultimate Bearing capacity if water table rise 0.5m above foundation level. The bearing capacity factors are.

ϕ	N_c	N_q	N_y
10	8.0	1.9	0.5
15	9.7	2.7	0.9
20	11.8	3.9	1.7
25	14.8	5.6	3.2
30	19.0	8.3	5.7

11. a) Discuss the various modes of classification of piles? **6**

b) A precast concrete pile $(35cm \times 35cm)$ is driven by a single acting steam hammer. Estimate the allowable load using Hiley formula take FOS = 04. **7**

i) Height of fall of Hammer =100cm

ii) Weight of hammer = 35kN

iii) Length of Pile = 15cm

iv) Efficiency of hammer = 0.8

v) Coefficient of restitution = 0.5

vi) No of blow for last 25.4mm = 6

vii) Sum of temporary elastic constant = 1.83

viii) Weight of pile cap = 3kN

OR

12. a) Explain 'Negative Skin Friction'. **6**

b) A group of 9 pile arranged in a square pattern with diameter & length of pile as 25cm and 10m respectively, is used as a foundation in soft clay deposit; $q_u = 120\,kN/m^2$ and the pile spacing as 100cm centre to centre. Find the load capacity of group. Assume bearing capacity factor $N_c = 9$ and adhesion factor = 0.75 & factor of safety = 2.5 **7**

(Use density of concrete 24 kN/m^3).

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B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Hydrology & Water Resources (HWR)

P. Pages : 2 **AHK/KW/19/2171**

Time : Three Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
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3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) Describe hydrological cycle. Explain with neat sketch the various process involved in it. **7**

b) What are the factors affecting precipitation with respect to physiographic divisions of India. **6**

OR

2. a) Differentiate between : **6**

i) Non – automatic and automatic rain gauges.

ii) Conventional and cyclonic precipitation.

b) There are five rain gauge stations existing in the catchment area of river. The mean rainfall at these stations are 820, 710, 650, 590 and 690 mm respectively. If it is desired to limit the error in the mean value of rainfall in the catchment to 8%. Determine the optimum number of rain gauges required in the catchment. How many more rain gauges are required to be installed. **7**

3. a) Define infiltration. Explain various factors affecting infiltration? **7**

b) The rainfall rate for successive 30 minute span of a 4 hrs. are 25, 50, 110, 75, 40, 85 and 15mm/hr. If net rainfall during this storm is 75 mm, find the value of ϕ – index & w-index. **7**

OR

4. a) What is evapotranspiration? State and explain various factors affecting it. **7**

b) Write notes on : **7**

i) Water budget

ii) Interception and its measurement.

5. a) What is runoff? What are the factor affecting it? **6**

b) The mean monthly temp. over a basin for 12 months period from June to May, 25.8, 24.4, 23.8, 23.5, 23.6, 20.2, 17.1, 16.6, 18.5, 23.3, 27.6 & 28.4ºC respectively. The observed rainfall in mm in corresponding months are 86, 229, 208, 115, 15, 182, 10, 24, 24, 12, 0 & 0 respt. Determine annual runoff from the basis by using Khosla’s formula. **7**

OR

6. a) Differentiate between Hydrograph and Hyetograph. **6**

b) Ordinates of 3 hr. unit hydrograph at every one Hr. interval starting from 0 to 11 hr are 0, 25, 100, 160, 190, 170, 130, 80, 30, 10, 5 & 0 m^3/sec respt. Derive the ordinates of 4 hr OH. **7**

7. a) Explain the various causes of Flood and discuss its effect. **6**

b) A culvert is to be design for a stream of catchment area 200 Ha. This area has a slope 1 in 1000 and length of travel for water is 1150 m. Estimate the 25 year flood if the max intensity of rainfall is given by $I = \frac{1000\,Tr^{0.2}}{(t+20)0.7}$. **7**

Where I is in mm/hr, Tr in year & t is min. Assume C = 0.35.

OR

8. a) Explain Gumbel's method of estimation of flood discharge. **6**

b) Explain Flood routing & flood forecasting. **7**

9. a) Difference between confined and unconfined aquifer. **6**

b) During recuperation the water level in an open well was depressed by 2.0 m. and is recuperated by an amount of 1.10 m in 60 min. Determine the yield from a well of 2.5 meter dia., under the depression head of 3 m. **7**

OR

10. a) Define : **6**
i) Porosity ii) Permeability
iii) Specific yield

b) Write notes on : **7**
i) Ground exploration
ii) Electrical sensitivity method

11. a) Explain various methods of ground water recharging. **7**

b) Explain with neat sketch "Roof Top rain water harvesting. **7**

OR

12. Write short notes on **any three.** **14**

i) Inter basin transfer

ii) Water resource planning through watershed management.

iii) Sunshine recorder

iv) Importance of Water Resources Planning.

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