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10MAT41

Fourth Semester B.E. Degree Examination, June/July 2013
Engineering Mathematics – IV

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Use of Statistical tables permitted.

PART – A

- 1 a. Use modified Euler's method to solve $\frac{dy}{dx} = x + y$, $y(0) = 1$ at $x = 0.1$ for three iterations taking $h = 0.1$. (06 Marks)
- b. Solve $\frac{dy}{dx} = x + y$, $x = 0$, $y = 1$ at $x = 0.2$ using Runge-Kutta method. Take $h = 0.2$. (07 Marks)
- c. Using Milne's predictor-corrector method find $y(0.3)$ correct to three decimals given, (07 Marks)

x	-0.1	0	0.1	0.2
y	0.908783	1.0000	1.11145	1.25253

- 2 a. Approximate y and z at $x = 0.2$ using Picard's method for the solution of $\frac{dy}{dx} = z$, $\frac{dz}{dx} = x^3(y + z)$ with $y(0) = 1$, $z(0) = 1/2$. Perform two steps (y_1, y_2, z_1, z_2) . (10 Marks)
- b. Using Runge-Kutta method solve $y'' = x(y')^2 - y^2$ at $x = 0.2$ with $x_0 = 0$, $y_0 = 1$, $z_0 = 0$ take $h = 0.2$. (10 Marks)
- 3 a. If $f(z) = u + iv$ is analytic prove that Cauchy-Reimann equations $u_x = v_y$, $u_y = -v_x$ are true. (06 Marks)
- b. If $w = z^3$ find dw/dz . (07 Marks)
- c. If the potential function is $\phi = \log \sqrt{x^2 + y^2}$. Find the stream function. (07 Marks)
- 4 a. Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = j, o, -i$. (06 Marks)
- b. Discuss the conformal transformation $w = e^z$. Any horizontal strip of height 2π in z -plane will map what portion of w -plane. (07 Marks)
- c. State and prove Cauchy's integral formula. (07 Marks)

PART – B

- 5 a. Prove that $J_{1/2}^{(x)} = \sqrt{\frac{2}{\pi x}} \sin x$. (06 Marks)
- b. State and prove Rodrigues formula for Legendre's polynomials. (07 Marks)
- c. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomial. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 6 a. The probabilities of four persons A, B, C, D hitting targets are respectively $1/2$, $1/3$, $1/4$, $1/5$. What is the probability that target is hit by atleast one person if all hit simultaneously? (06 Marks)
- b. i) State addition law of probability for any two events A and B.
 ii) Two different digits from 1 to 9 are selected. What is the probability that the sum of the two selected digits is odd if '2' one of the digits selected. (07 Marks)
- c. Three machine A, B, C produce 50%, 30%, 20% of the items. The percentage of defective items are 3, 4, 5 respectively. If the item selected is defective what is the probability that it is from machine A? Also find the total probability that an item is defective. (07 Marks)

- 7 a. The p.d.f of x is

x	0	1	2	3	4	5	6
p(x)	k	3k	5k	7k	9k	11k	13k

Find k. Also find $p(x \geq 5)$, $p(3 < x \leq 6)$. (06 Marks)

- b. A die is thrown 8 times. Find the probability that '3' falls,
 i) Exactly 2 times
 ii) At least once
 iii) At the most 7 times. (07 Marks)
- c. In a certain town the duration of shower has mean 5 minutes. What is the probability that shower will last for i) 10 minutes or more; ii) less than 10minutes; iii) between 10 and 12 minutes. (07 Marks)
- 8 a. What is null hypothesis, alternative hypothesis significance level? (06 Marks)
- b. The nine items of a sample have the following values: 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significantly from the assumed mean of 47.5. Apply student's t-distribution at 5% level of significance. ($t_{0.05}$ for 8df = 2.31). (07 Marks)
- c. In experiments on a pea breeding, the following frequencies of seeds were obtained:

Round-yellow	Wrinkled yellow	Round green	Wrinkled green	Total
315	101	108	32	556

Is the experiment is in the agreement of theory which predicts proportion of frequencies 9:3:3:1 ($\chi^2_{0.05, 3df} \approx 7.815$). (07 Marks)

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10CV42

Fourth Semester B.E. Degree Examination, June/July 2013
Concrete Technology

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.**
2. Use of IS 10262-2009 is permitted.
3. Assume any missing data suitably.

PART – A

- 1 a. What are the constituents of cement? Explain the role of constituents in controlling the properties of cement. (08 Marks)
- b. Define the terms: i) Standard consistency ii) Fineness and iii) Soundness. Explain their significance. (06 Marks)
- c. Distinguish between i) False set and Flash set ii) Dry process and wet process iii) Hydraulic cements and non-hydraulic cements. (06 Marks)
- 2 a. How do you classify aggregates? Describe the characteristics of aggregate influencing the behavior of concrete. (10 Marks)
- b. Explain the significance of Bulking of Fine aggregates and Gap grading. (04 Marks)
- c. In a sieve analysis of 1000 gms of sand, the weights (gm) retained on different I.S. sieves are: 10mm = 0, 4.75mm = 20, 2.36mm = 100, 1.18mm = 100, 600 Microns = 190, 300 microns = 350, 150 Microns = 170 and passing 150 microns = 70. Determine the fineness modulus of sand. (06 Marks)
- 3 a. Explain the factors affecting consistency and cohesiveness of fresh concrete mixtures, Suggest ways to improve. (08 Marks)
- b. Explain any two methods, equipments and advantages of handling and placing concrete. (06 Marks)
- c. Explain the significance of setting time of concrete. (06 Marks)
- 4 a. Explain the role of mineral admixture and chemical admixtures. (08 Marks)
- b. What are supplementary cementitious materials? Explain the characteristics and use of any two. (06 Marks)
- c. Discuss the composition and usefulness of rice husk ash and GGBs. (06 Marks)

PART – B

- 5 a. Depict the interplay of factors influencing concrete strength, preferably through a simplified flow chart. (08 Marks)
- b. Establish the relationship between (i) compressive strength and tensile strength ii) Cube strength and cylinder strengths. (06 Marks)
- c. Strength of a fully mature concrete is 30 MPa. Find the strength of concrete at an age of 7 days when cured at an average temperature of 25°C during day (12 hours) and 10°C during night (12 hours). Use the relation for strength at maturity as percentage of strength at full maturity, express as $A + B \log_{10} \frac{\text{Maturity}}{1000}$, when $A = 21$ and $B = 61$ corresponding to strength at full maturity. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- 6 a. Explain the elastic behavior of concrete and the relationship between modulus of elasticity and strength. (10 Marks)
- b. Distinguish between: (i) Creep and shrinkage (ii) Plastic shrinkage and drying shrinkage. (06 Marks)
- c. If the volume of paste is 40% of the total volume and E_p and E_a are 2,00,000 and 3,20,000 kg/cm^2 . What is the modulus of elasticity of concrete? (04 Marks)
- 7 a. Define durability. Explain how concrete is made durable against (i) sulphate attack (ii) freezing and thawing (iii) corrosion of steel. (12 Marks)
- b. Why is the permeability of mortar or concrete is higher than the corresponding cement paste? Explain. (08 Marks)
- 8 Design a concrete mix for a concrete of M_{45} grade as per IS10262-2009 guidelines. With following stipulations and test data for materials.
- A-1 stipulations for PROPORTIONING:
- Grade Designation : M_{45}
 - Type of cement OPC 53 conforming to IS12269-1987.
 - Maximum nominal size of aggregate : 20 mm
 - Minimum cement content : 360 kg/m^3
 - Maximum water cement ratio : 0.45
 - Workability : 125 mm (slump)
 - Exposure condition: Severe (for RCC)
 - Method of concrete placing : Pumping.
 - Degree of supervision : Good
 - Type of aggregate : Sub angular aggregate
 - Maximum cement content : 450 kg/m^3
 - Chemical admixture type : Superplasticiser
(Capable of reducing water content upto 20% max.)

A-2 TEST DATA FOR MATERIALS

Material	Sp. Gr.	Water absorption	Free (surf) moisture	
CEMENT	3.15	-	-	TYPE I II IS383 60% 40% ZONE-I(IS383)
COARSE AGGREGATE	2.70	0.5	NIL (also absorbs moisture)	
FINE AGGREGATE	2.60	1.0	NIL	
Superplasticiser	1.145	-	-	

COARSE AGGREGATE

I.S.Sieve mm	Analysis of coarse aggregate		Percentage of different fractions			Remarks
	I	II	I_{60}	II_{40}	Combined 100	
20	100	100	60	40	100	Conforming to Table 2 of IS383
10	0	71.20	0	28.50	28.50	
4.75		9.40		3.70	3.70	
2.36		0				

FINE AGGREGATE: Conforming to grading ZONE-I of Table 4 of IS383.

(20 Marks)

CHART - TABLE

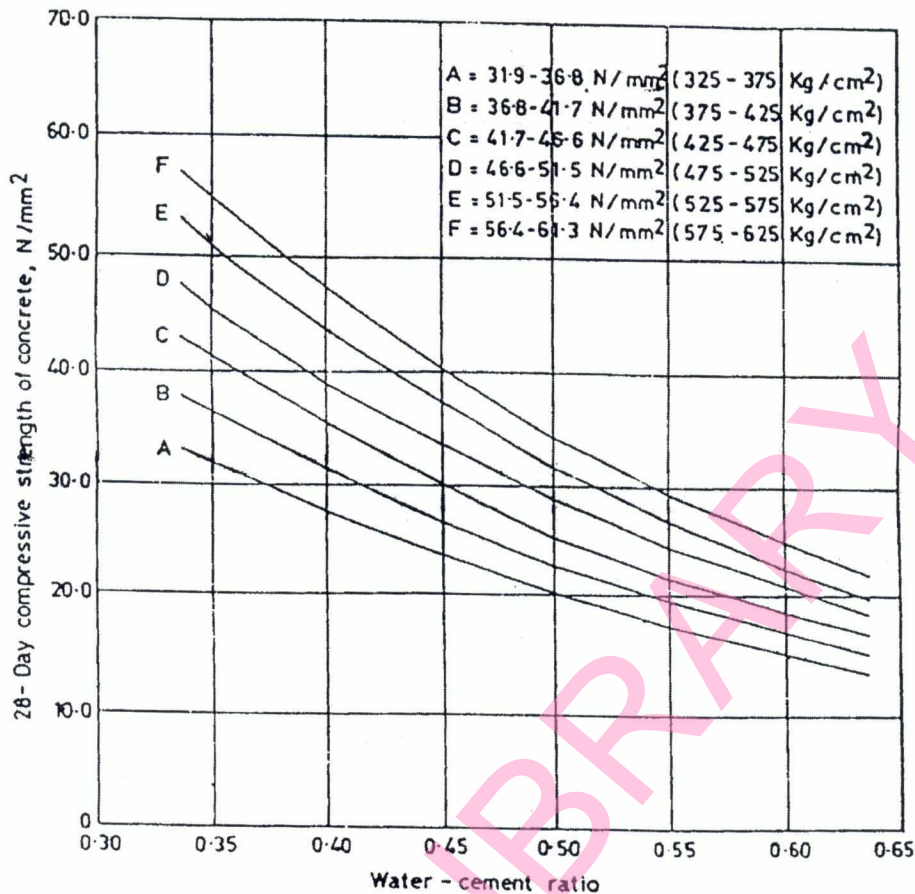


Fig 1 Relation between free water-cement ratio and concrete strength at 28 days for different cement strengths

TABLE-1

Type of exposure	Exposure			
	Plain concrete		Reinforced concrete	
	maximum free water-cement ratio, by weight	minimum cement content, kg/m ³	maximum free water-cement ratio, by weight	minimum cement content, kg/m ³
MILD — completely protected against weather, or aggressive conditions, except for a brief period of exposure to normal weather conditions during construction	0.70	220	0.65	250
MODERATE — sheltered from heavy wind-driven rain and against freezing when saturated with water; buried concrete in soil; and, concrete continuously under water	0.60	250	0.55	290
SEVERE — exposed to sea water, alternate wetting and drying; freezing while wet; subject to heavy condensation or corrosive fumes	0.50	310	0.45	360

Source: IS:456-1978.

Notes: (i) When the maximum water-cement ratio can be strictly controlled, the cement content in Table 1 may be reduced by 10 percent.
 (ii) Minimum cement content is based on 20-mm aggregate; for 40-mm aggregate, reduce it by 10 percent, and for 12.5-mm aggregate, increase it by 10 percent.

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Fourth Semester B.E. Degree Examination, June/July 2013
Structural Analysis – I

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Explain with examples statistically determinate and indeterminate structures. (05 Marks)
- b. Find degree of indeterminacy of following structures: (05 Marks)

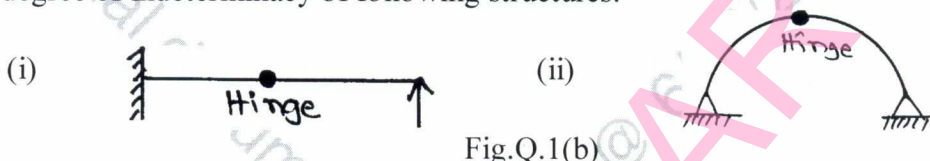


Fig.Q.1(b)

- c. Derive an expression for strain energy stored due to bending. (10 Marks)

- 2 a. Using conjugate beam method, find slope at "A", maximum deflection and its location, for the beam shown. (12 Marks)

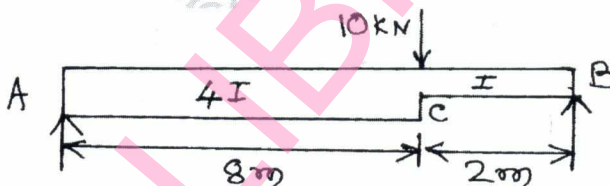


Fig.Q.2(a)

- b. Determine slope and deflection at the free end of the cantilever beam shown in Fig.Q.2(b). Using moment area method. (08 Marks)

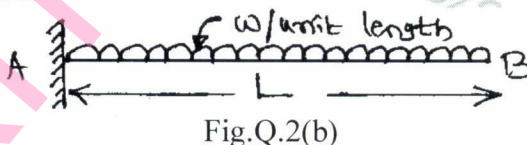


Fig.Q.2(b)

- 3 a. Derive Clarke-Maxwell's theorem of reciprocal deflection. (08 Marks)
- b. Find the horizontal deflection at point C for the frame shown in Fig.Q.3(b), using strain energy method. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 2 \times 10^8 \text{ mm}^4$. (12 Marks)

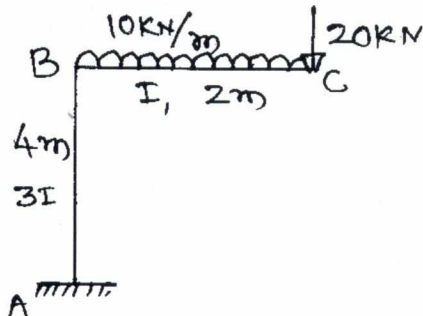


Fig.Q.3(b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- 4 a. Analyze the propped cantilever by strain energy method and draw SFD and BMD. (10 Marks)

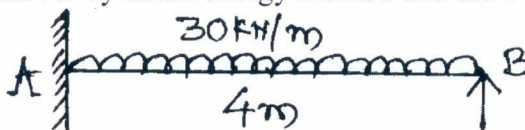


Fig.Q.4(a)

- b. Analyze the fixed beam by strain energy method and draw SFD and BMD. (10 Marks)

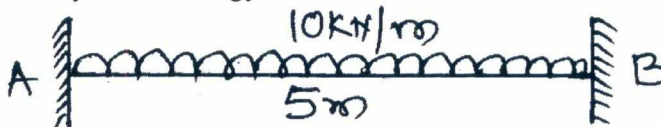


Fig.Q.4(b)

PART - B

- 5 a. A three hinged parabolic arch has a span of 20m and a rise of 5m. It carries a UDL of 2 kN/m over the left half of the span and a point load of 12 kN at 5m from the right end. Find the B.M., normal thrust and radial shear at a section 4m from left end (12 Marks)
- b. A cable is suspended between two points A and B, 100m apart and a central dip of 8m. It carries UDL of 20 kN/m. Find: i) Length of the cable; ii) Maximum and minimum tension in the cable. (08 Marks)
- 6 a. Analyze the propped cantilever by consistent deformation method and draw SFD only. (10 Marks)

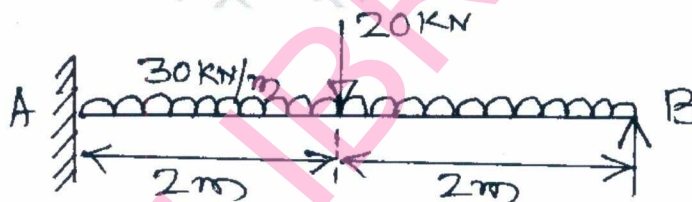


Fig.Q.6(a)

- b. Analyze the fixed beam by consistent deformation method and draw BMD only. (10 Marks)

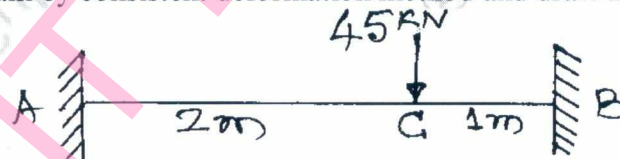


Fig.Q.2(b)

- 7 Analyze the continuous beam shown by theorem of three moments and sketch BMD and SFD. EI - constant. (20 Marks)

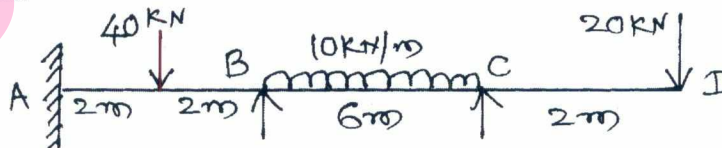


Fig.Q.7

- 8 A two hinged parabolic arch has a span of 30m and rise 5m. A concentrated load 90 kN acts at 10m from the right hinge. The second moment of area varies as the secant of the slope of the rib axis. Find horizontal thrust and reactions at the hinges. Also draw BMD. (20 Marks)

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10CV44

Fourth Semester B.E. Degree Examination, June/July 2013
Surveying – II

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Explain the following terms with reference to a theodolite: i) Transiting; ii) Swinging; iii) Line of collimation; iv) Centering; v) Vertical axis. (10 Marks)
- b. Describe the method of measuring horizontal angle by repetition method. What are the errors that are eliminated by repetition method? (10 Marks)
- 2 a. What are the fundamental lines of a theodolite? State the desired relationships between them. (10 Marks)
- b. Explain with a sketch “two peg method” adopted in the permanent adjustments of a level. (10 Marks)
- 3 a. Explain the method of determining the distance and elevation of an object using trigonometric levelling. When the base is inaccessible and the instrument stations are in the same plane as that of the object. Derive the required equations. (10 Marks)
- b. Find the reduced level of a Church spire ‘C’ from the following observations taken from two stations A and B, 50m apart. Angle BAC = 60° and angle ABC = 50°, Angle of elevation from A to top of spire = 30°, Angle of elevation from B to top of spire = 29°, Staff reading from A on BM of RL 20m = 2.50m, Staff reading from B to same BM = 0.50m. (10 Marks)
- 4 a. Derive the tacheometric equation for horizontal line of sight and hence obtain the tacheometric equation for inclined line of sight. (10 Marks)
- b. The following are the observations taken from a tacheometric station. Find the gradient of line AB. Tacheometric constant 100 and 0.3.

Instrument station	Staff station	Bearing	Vertical angle	Staff intercept	Axial hair reading
P	A	40° 35'	-4° 24'	2.175	1.965
P	B	117° 05'	-5° 12'	1.985	1.865

(10 Marks)

PART – B

- 5 a. Explain the method of setting out of simple curve by offsets from Chords produced method with a sketch. (10 Marks)
- b. Two tangents intersect a chainage 1192m, the deflection angle being 50°30'. Calculate the data for setting out a curve of 300m radius to connect two tangents by Rankine’s method. Take peg interval of 20m. (10 Marks)

- 6 a. With a sketch, explain the various elements of a compound curve. Derive the relations for calculating the chainages of tangent points. (10 Marks)
- b. Two parallel railway lines are to be connected by a reverse curve, each section having the same radius. If the lines are 12m apart and the maximum distance between tangent points measured parallel to the straights is 48m, find the maximum allowable radius. Calculate the chainage of point of reverse curvature and point of Tangency, if the chainage of $T_1 = 912\text{m}$. (10 Marks)
- 7 a. What is a transition curve? Enumerate the functions and conditions to be fulfilled by a transition curve. (10 Marks)
- b. A road which deflects 80° is to be designed for a maximum speed of 100 kmph, maximum centrifugal ratio is $1/4$ and maximum rate of change of radial acceleration is 0.3 m/s^2 . The curve consists of circular arc combined with two cubic spirals. Calculate:
- Radius of the circular arc.
 - Length of transition curve.
 - Length of total curve.
 - Chainage of tangent points and junction points if point of intersection is 42862m. (10 Marks)
- 8 a. The following offsets were taken from a chain line to an irregular boundary line at an interval of 10m. Compute the area by trapezoidal and Simpson's rule. Offsets: 0, 2.5, 3.5, 5.0, 4.6, 3.20 and 0m. (10 Marks)
- b. An embankment of width 10m and side slope 1V:1.5H is required. The central heights at 40m interval are as follows: 0.90, 1.25, 2.15, 2.50, 1.85, 1.35 and 0.85m, calculate the volume of earth work by trapezoidal and prismoidal rule. (10 Marks)

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10CV45

Fourth Semester B.E. Degree Examination, June/July 2013
Hydraulics and Hydraulic Machines

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

1.
 - a. Define the dimensional homogeneity. Give an example. (06 Marks)
 - b. State and explain Buckingham's theorem. (06 Marks)
 - c. A 7.2m high and 15m long spillway discharges 94 m³/sec of water under a head of 2m. If a 1:9 scale model of this spillway is to be constructed, determine model dimensions, head over the spillway model and model discharge. If model experiences a force of 7500N, determine force on the prototype. (08 Marks)

2.
 - a. Bring out the difference between flow through pipes and flow through open channel. (06 Marks)
 - b. Derive the conditions for the most economical trapezoidal channel section. (06 Marks)
 - c. A rectangular channel carries water at the rate of 400 litres/sec when bed slope is 1 in 2000. Find the most economical dimensions of the channel if C = 50. (08 Marks)

3.
 - a. Define specific energy. Draw specific energy curve, and then derive expressions for critical depth and critical velocity. (06 Marks)
 - b. Derive the expression for sequent depths of hydraulic jump occurring in a rectangular channel. (06 Marks)
 - c. A sluice gate discharges water into a horizontal rectangular channel with a velocity of 5m/sec and depth of flow is 0.4m. The width of the channel is 6m. Determine whether a hydraulic jump will occur, and if so find its height and loss of energy per kg of water. Also determine the power lost in the hydraulic jump. (08 Marks)

4.
 - a. State impulse momentum equation. (02 Marks)
 - b. Show that the force exerted by a jet of water on an inclined fixed plate in the direction of the jet is given by $F_x = \rho a v^2 \sin^2\theta$. (08 Marks)
 - c. A jet of water 75mm diameter having a velocity of 20 m/sec strikes normally a flat smooth plate. Determine the thrust on the plate.
 - i) If the plate is at rest.
 - ii) If the plate is moving in the same direction as the jet with a velocity of 5 m/sec.
 Also find the workdone per second on the plate in each case and the efficiency of the jet when the plate is moving. (10 Marks)

PART – B

- 5 a. Derive an expression for the force exerted by a jet of water on a moving semi-circular plate in the direction of the jet when the jet strikes at the centre of semicircular plate. (08 Marks)
- b. A jet of water with a velocity of 40 m/s strikes a curved vane which moves with a velocity of 20 m/s. The jet makes an angle of 30° with the direction of motion of the vane at the inlet and leaves at 90° to the direction of motion of the vane at the outlet. Determine vane angles at the inlet and outlet if water enters and leaves without shock. Also determine efficiency. (12 Marks)
- 6 a. Draw a neat sketch of an hydroelectric power plant. Mention the functions of each component. (06 Marks)
- b. How will you classify the turbines? (06 Marks)
- c. Design a Pelton wheel with the following data, shaft power = 735.75 kW $H = 200\text{m}$, $N = 800$ rpm $\eta_0 = 0.86$ $D/d = 10$ $C_v = 0.98$ $\phi = 0.45$. Determine D , d and number of jets. (08 Marks)
- 7 a. Draw the neat sketch of Kaplan turbine and mention the parts. (08 Marks)
- b. A Kaplan turbine runner is to be designed to develop 10000 kW. The net head is 6.0m. The speed ratio = 2.09, flow ratio = 0.68, overall efficiency is 80% and diameter of the loss is $1/3$ the diameter of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine. (12 Marks)
- 8 a. Derive an expression for the minimum starting speed for a centrifugal pump. (10 Marks)
- b. What is priming of a centrifugal pump and how is it done? (04 Marks)
- c. A centrifugal pump runs at 1000 rpm and delivers water against a head of 15m. The impeller diameter and width at the outlet are 0.3m and 0.05m respectively. The vanes are curved back at an angle of 30° with the periphery at the outlet $\eta_{\text{man}} = 0.92$ find discharge. (06 Marks)

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10CV46

Fourth Semester B.E. Degree Examination, June/July 2013
Building Planning and Drawing

Time: 4 hrs.

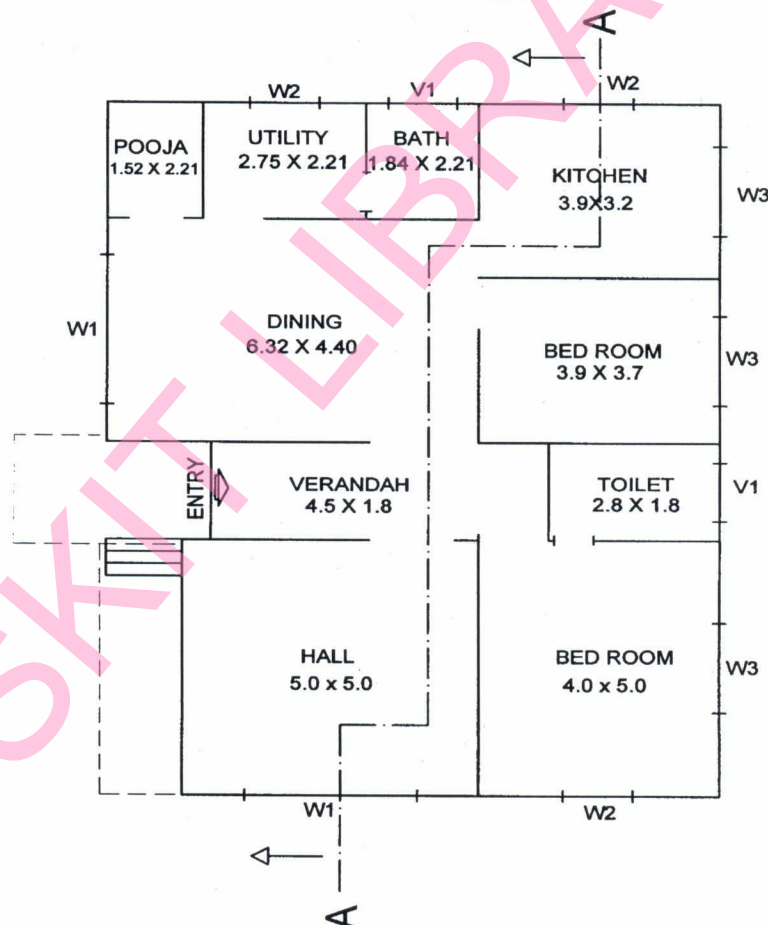
Max. Marks:100

**Note: Answer SECTION-I compulsory and answer
any TWO full questions from SECTION-II**

SECTION – I (Compulsory)

- 1 The line diagram of a residential building is shown in Fig.Q1. Draw to a scale of 1:100.
- Plan at sill level (25 Marks)
 - Front Elevation (15 Marks)
 - Section along A – A (15 Marks)
 - Schedule of openings. (05 Marks)

Note: Take all load bearing walls of 230 mm thick and partition walls 115 mm thick, built with BBM in CM 1:6. Foundation is of SSM in CM 1:6. Height of the roof 3.15m from plinth level. Lintel level is at 2.1 m above plinth level. Width of foundation 1 m. Depth of foundation 1.2 m. Plinth level 0.6 m above ground level.



W1 2.5m x 2m

W2 1.25m x 1.2m

W3 1.8m x 1.2m

V1 1m x 0.6m

All doors 1m x 2.1m except bathroom doors 0.9m x 2.1m

Fig.Q1

SECTION – II

- 2 Draw a steel truss for the span of a industrial building 20 m. Assume suitable sections for the truss. Provide Gusset plates at junctions of the truss members. Assume standard accessories required for the truss. The truss has to support A.C. sheet roofing. (20 Marks)
- 3 Develop a plan for a college canteen with the following data:
 i) Students capacity at canteen (seating) – 100 Nos.
 ii) Food counter – 16 sqm
 iii) Kitchen – 20 sqm
 iv) Wash – 16 sqm
 v) Store – 16 sqm
 vi) Toilets each separate for girls and boys 12 sqm. Assume suitable dimensions for the site. (20 Marks)
- 4 Prepare a bubble diagram (connectivity diagram) and develop a line diagram for a primary health centre. The requirements are as follows:
 i) Reception/Registration counter ii) Consulting Doctor's room – 2 Nos.
 iii) Laboratory iv) Minor operation theatre
 v) Medical store vi) Office
 vii) Toilets. (20 Marks)
- 5 The line diagram of a residential building is shown in Fig.Q5. Prepare water supply, sanitary and electrical layout plan. Draw to a scale of 1:50. (20 Marks)

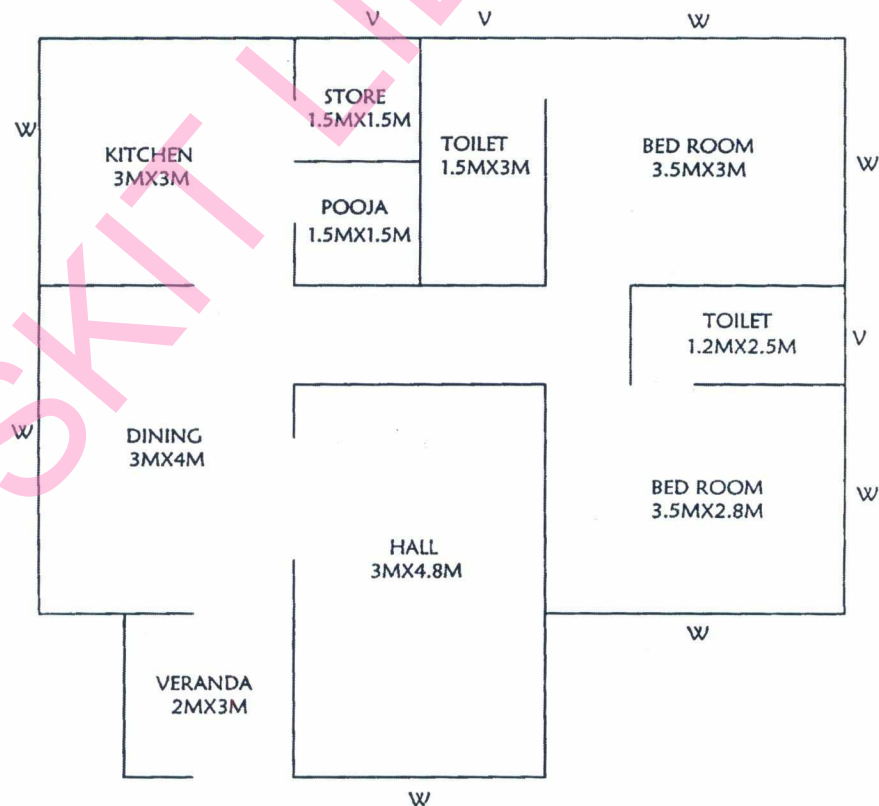


Fig.Q5

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