KATIHAR ENGINEERING COLLEGE, KATIHAR

CIVIL ENGINEERING, 3rd Year (Semester-VI)

Subject: Design of Concrete Structure-I   **Max. Marks: 10**

Time Allotted: 60 Minutes   **Instructor: Rashid Mustafa**

Test-I

Q.1 The characteristics compressive strength of concrete required in a project is 25 MPa and the standard deviation in the observed compressive strength expected at site is 4 N/mm^2. The average compressive strength of cubes tested at different water cement (w/c) ratios using the same material as is used for the project is given in table

(w/c) (%)	45	50	55	60
Average compressive strength of cube (MPa)	35	25	20	15

The water cement ratio (in percent) to be used in the mix --------------------------------

Q.2 When a specimen of M25 concrete is loaded to a stress level of 12.5 MPa, a strain of 500×10^{-6} is recorded. If this load is allowed to stand for a long time, the strain increases to 1000×10^{-6}. In accordance with the provisions of IS 456:2000, considering the long term effects, the effective modulus of elasticity of concrete (in MPa) is ------------------------------------

Q.3 For a given loading on a rectangular plain concrete beam with an overall depth of 500 mm, the compressive strain and tensile strain developed at the extreme fibers are of the same magnitude of

2.5×10^{-4}. The curvature in the beam cross-section (in mm^{-1}) if grade of concrete is M25 ------------------

Q.4 The frequency distribution of the compressive strength of 20 concrete cube specimens is given in the table.

f (MPa)	Number of specimens with compressive strength equal to f
23	4
28	2
22.5	5
31	5
29	4

If μ is the mean strength of the specimens and σ is the standard deviation, the number of specimens (out of 20) with compressive strength less than $\mu - 3\sigma$ is----------------------------

Q.5 As per IS 456 : 2000, the minimum percentage of tension reinforcement (up to two decimal places) required in reinforced-concrete beams of rectangular cross-section (considering effective depth in the calculation of area) using Fe500 grade steel is -------------------------------
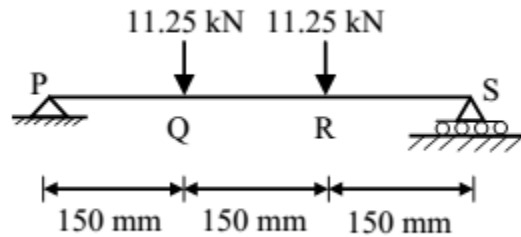
Q.6 A reinforced-concrete slab with effective depth of 80 mm is simply supported at two opposite ends on 230 mm thick masonry walls. The centre-to-centre distance between the walls is 3.3 m. As per IS 456: 2000, the effective span of the slab (in m, up to two decimal places) is--------------------------------

Q.7 A singly-reinforced rectangular concrete beam of width 300 mm and effective depth 400 mm is to be designed using M25 grade concrete and Fe500 grade reinforcing steel. For the beam to be under-reinforced, the maximum number of 16 mm diameter reinforcing bars that can be provided is---------------

Q.8 Let the characteristics strength be defined as that value, below which not more than 50% of the result are expected to fall. Assuming a standard deviation of 4 MPa, the target mean strength (in MPa) to be considered in the mix design of a M25 concrete would be --------------------------------

Q.9 A reinforced concrete (RC) beam with width of 250 mm and effective depth of 400 mm is reinforced with Fe415 steel. As per the provisions of IS 456-2000, the minimum and maximum amount of tensile reinforcement (expressed in mm^2) for the section are ------------------ and ------------ respectively.

Q.10 A 450 mm long plain concrete prism is subjected to the concentrated vertical loads as shown in the figure. Cross section of the prism is given as 150 mm × 150 mm. Considering linear stress distribution across the cross-section, the modulus of rupture (expressed in MPa) is

Q.11 A simply supported beam has an effective span of 16 m. What shall be the limiting ratio of span to effective depth as per IS 456-2000 ------------------------

Q.12 A reinforced concrete beam is subjected to dead load of 20 kN/m, live load of 30 kN/m and seismic load of 10 kN/m. The design bending moment for limit state of collapse is -------------------kN-m

Q.13 In limit state design method, the moment of resistance for a balanced section using M20 grade concrete and HYSD steel of grade Fe 415 is given by $M_{lim} = kbd^2$, what is the value of k ------------------

Q.14 The difference between modular ratios calculated by basic definition and suggested by IS 456-2000 for M20 grade of concrete is-------------------

Q.15 A T beam roof section has thickness of slab =100 mm, width of rib 300 mm, depth of beam = 500 mm, centre to centre distance of beam =3 m, effective span of beam = 6 m and distance between points of contraflexure = 3.6m. The effective width of flange of beam is in -------------------------------- mm