



# PAKISTAN ENGINEERING COUNCIL

## Sample MCQs

### Civil Engineering (Structures)

1. Please read all the instructions carefully and do not start the paper unless asked to do so.
2. Fill in your particulars (Name, Roll Number, PEC Registration Number, CNIC and Discipline) in BLOCK letters in the space provided.
3. You are not allowed to change your seat during the test.
4. Hand over your answer sheet to the invigilator at the end of each part and keep seated until allowed to leave the centre.
5. The examination is divided into three Parts viz Part-I, Part-II and Part-III, with 30 minutes break.
6. All questions are to be attempted and carry equal marks.
7. Passing marks for each part is 60%, and passing all three parts is mandatory to qualify EPE.
8. Use only the provided pencil to fill completely the correct choice circle on answer sheet.
9. Programmable calculator, laptop, mobile phone, iPod, and any storage device/electronic gadget are not allowed.
10. No extra sheet will be provided; any calculation may be worked out on the back of the paper.
11. No candidate is allowed to indulge in any Law and Order situation to affect the exam process, and responsible(s) will be disqualified.
12. Use of unfair means will also lead to disqualification.

#### Instructions for Part-I

This part is common to all disciplines, comprising 30 multiple choice questions of one mark each (Total Marks=30) with the duration of two hours.

#### Instructions for Part-II

This is a discipline based open book breadth examination, comprising 30 multiple choice questions of one mark each (Total Marks=30), with the duration of two hours.

#### Instructions for Part-III

This is a discipline based open book depth examination comprising 40 multiple choice questions of one mark each (Total Marks=40), with duration of three hours. The candidates will be allowed only for the specialized field / area of practice, for which already applied at the time of application.

# Civil Engineering (Structures)

## Part-I

**Total Marks: 30**

**Total Time: 2 hours**

<b>Name:</b>	<b>S/o, D/o, w/o:</b>
<b>Roll Number:</b>	<b>PEC Reg#:</b>
<b>CNIC:</b>	<b>Discipline:</b>

**Q.1:** Quality control is aimed at:

- a. Maintaining the desired quality
- b. Exceeding the desired quality
- c. Continuously improving the quality
- d. Following the quality

**Q.2:** Which of these is correct with respect to a product developed or a service performed?

- a. Bad quality is acceptable, but bad grade is not.
- b. Bad grade is acceptable, but bad quality is not.
- c. Neither bad grade nor quality is acceptable.
- d. Grade and quality is the same thing.

**Q.3:** Project A has an internal rate of return (IRR) of 21 percent. Project B has an IRR of 7 percent. Project C has an IRR of 31 percent. Project D has an IRR of 25 percent. Which of these would be the BEST project?

- a. Project A
- b. Project B
- c. Project C
- d. Project D

**Q.4:** What characteristic best describes the cost baseline?

- a. Total budget for the project
- b. Time phased budget for the project
- c. Total budget for the project including the contingency budget

- d. Total budget for the project including the contingency budget and the management reserve.

**Q.5:** Present worth is:

- a. The discounted future cash flows to the present
- b. The compounding present cash flows to the future
- c. The current market value of the investment
- d. The opportunity cost at the present value.

**Q.6:** The first preferred way to resolve a dispute between the contracting parties is:

- a. Arbitration
- b. Litigation
- c. Negotiation
- d. Mediation

**Q.7:** Following document define the legal rights and obligations of the parties and may be described as the regulations under which the contract will be performed.

- a. Specifications
- b. General Conditions of Contract
- c. Special provisions
- d. Bill of Quantities

**Q.8:** The minimum notice period for National Competitive bidding is:

- a. 30 days
- b. 45 days
- c. 35 days
- d. 15 days

**Q.9:** Tsunamis' is generated by:

- a. Earthquake
- b. Air currents
- c. Tidal waves
- d. Large Ocean waves

**Q.10:** Globalization has direct impact on:

- a. National security
- b. Economy
- c. Society
- d. All above

**Q.11:** The passive voice for the sentence "He is writing a letter" is;

- a. A letter is wrote by him
- b. A letter is written by him
- c. A letter is being written by him
- d. A letter is been written by him

**Q.12:** Choose the correct sentence

- a. He is elder than me
- b. He is older than me
- c. He is ager than me
- d. He is older than I

**Q.13:** Effective communication is

- a. The transfer of message from sender to receiver
- b. Sending of message
- c. Receiving of message
- d. The transfer of message from sender to receiver and get the desired response.

**Q.14:** Body language is form of;

- a. Personality and attitudes
- b. Non verbal communication
- c. Individual preference for expression
- d. The body expression

**Q.15:** Project feasibility report is aimed at;

- a. Informing the people
- b. Attracting the customer
- c. Justifying the investment
- d. Giving details of resources

**Q.16:** Research Proposal synopsis is developed at;

- a. Final stage of research
- b. Initial stage of research
- c. Before approval of research proposal
- d. In the middle of research

**Q.17:** Project monitoring is required:

- a. Before commencement of the project
- b. During implementation of the project
- c. After completion of the project
- d. At any stage of the project deemed necessary

**Q.18:** Re-appropriation Statement is form of

- a. Progress report
- b. Budget report
- c. Financial report
- d. Normal report

**Q.19:** PC-III (A) is used for

- a. For weekly progress report of public sector projects
- b. Monthly progress report of public sector projects
- c. Yearly progress report of public sector projects
- d. Quarterly progress report of public sector projects.

**Q.20:** Acquiring management and leadership skills are \_\_\_\_\_ for a Professional Engineer

- a. Wastage of time
- b. Not important
- c. Highly important
- d. Not necessary

**Q.21:** Engineering ethics refers to:

- a. The rules and standards given by an institution for Engineering practice
- b. The rules and regulation relating to obligations and rights of others.
- c. The professional regulation
- d. The rules and standards which govern the conduct of Engineers as professional Engineers.

**Q.22:** How many commandments are given in PEC Code of Ethics?

- a. 20
- b. 30
- c. 10
- d. 05

**Q.23:** As per PEC Code of Conduct a member shall report unethical professional practices of an engineer or a member with substantiating data to

- a. Court of Law
- b. Concerned Department
- c. Pakistan Engineering Council
- d. Law enforcing Agency

**Q.24:** When a member uses designs, plans, specifications, data and notes supplied to him by a client or an employer or are prepared by him in reference to such client or the employer's work such designs, plans, specifications, data and notes shall remain the property of the \_\_\_\_\_ and shall not be duplicated for any use without the express permission of the \_\_\_\_\_.

- a. Member, Member
- b. Client, Client
- c. Member, Client
- d. Client, Member

**Q.25:** As per PEC Code of Conduct to maintain, uphold and advance the honor and dignity of the engineering professional, a member shall do following except:

- a. uphold the ideology of Pakistan
- b. be honest, impartial and serve the country, his employer, clients and the public at large with devotion.
- c. Uphold personal interest first
- d. use his knowledge and skill for the advancement and welfare of mankind

**Q.26:** Conflicts are faced when:

- a. There are more than one expected outcomes
- b. There are more than one expected benefits and losses
- c. There is choice between two or more moral values each having its own merits.
- d. There are opposing outcomes.

**Q.27:** An example of a conflict of interest would be:

- a. As a responsible official you make a decision about a contract award that will benefit you personally
- b. You and a functional manager disagree with a task cost estimate
- c. Your sponsor decides to cancel your project because it no longer supports the company strategy
- d. Your personality conflicts with that of a key member of your project team.

**Q.28:** Adherence to professional ethics is \_\_\_\_\_ an engineer to society.

- a. Not obligation of
- b. An obligation of
- c. Optional for
- d. None of above

**Q.29:** While designing a project by an engineer, \_\_\_\_\_ should be taken into account to protect cultural heritage

- a. All possible alternates
- b. No protection
- c. Minimum protection
- d. No care

**Q.30:** Close interpersonal relationships are characterized by high intimacy whereas distressed relationships tend to involve reciprocation of \_\_\_\_\_ behavior.

- a. positive
- b. negative
- c. normal
- d. casual

## **Answers:**

- 1. a
- 2. b
- 3. c
- 4. b
- 5. a
- 6. c
- 7. a
- 8. d
- 9. a
- 10. d
- 11. c
- 12. b
- 13. d
- 14. b
- 15. c
- 16. c
- 17. b
- 18. c
- 19. b
- 20. c
- 21. d
- 22. c
- 23. c
- 24. b
- 25. c
- 26. c
- 27. a
- 28. b
- 29. a
- 30. b

## Part-II (Breadth of discipline)

Total Marks: 30

Total Time: 2 hours

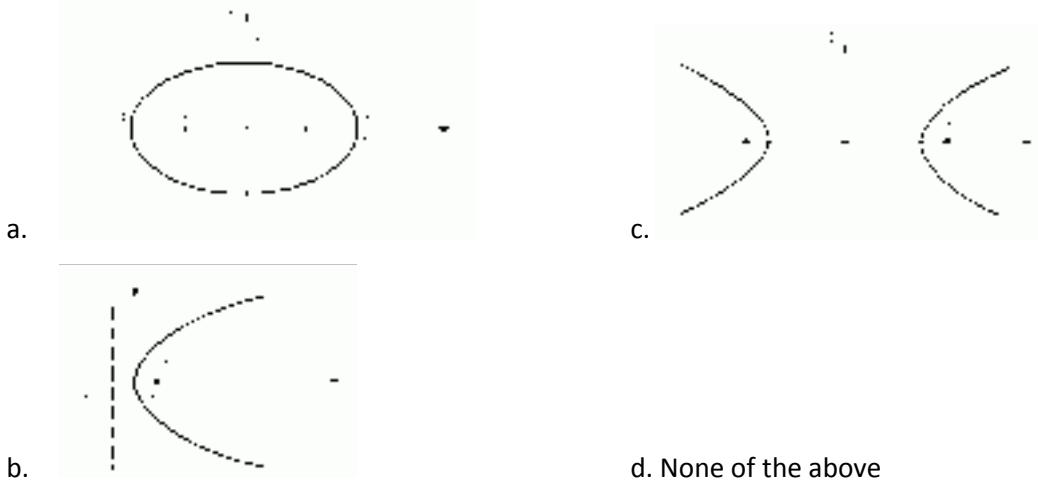
**Q.1:** An  $n \times n$  matrix is said to be symmetric if;

- a. If it is equal to its transpose
- b. If its determinant is equal to zero
- c. If it is of 2<sup>nd</sup> order
- d. None of the above

**Q.2:** Mathematically, what is a differential?

- a. A technique used for mathematical modeling.
- b. A method of directly relating how changes in an independent variable affect changes in a dependent variable.
- c. A method of directly relating how changes in a dependent variable affect changes in an independent variable.
- d. None of the above

**Q.3:** Which of the following is a hyperbola ?



**Q.4:** Unit of force in SI system (System International) of units is equal to:

- a. Pound
- b. Newton
- c. Kilogram
- d. All

**Q.5:** Resultant of system of forces can be determined by:

- a. Triangle law
- b. Parallelogram law
- c.  $\sqrt{R_x^2 + R_y^2}$
- d. All

**Q.6:** An automobile weighing 10,000N is driven down a  $5^\circ$  incline at a speed of 90 km/hr when the brakes are applied, causing a constant total braking force of 5000N. What will be the energy of automobile at initial position?

- a. 318.55 kN. m
- b. 553.18 kN. m
- c. 813.55 kN. m
- d. 855.13 kN. m

**Q.7:** The back sight reading on a BM of RL 500 m is 2.685 m and force sight reading on a point is 1.345 m, the RL of the point is:

- a. 502.685 m
- b. 501.340 m
- c. 501.345 m
- d. 504.030 m

**Q.8:** When R is the length of the curve (in meters), 'D' is the degree of the curve (in degree) and length of the chord 30 m, then the relation between 'R' and 'D' is:

- a.  $R = 1520/D$
- b.  $R = 1720/D$
- c.  $R = 4500/D$
- d.  $R = 5400/D$

**Q.9:** The brick bond used in Government Sector construction projects in Pakistan is;

- a. Flemish
- b. Double Flemish
- c. English
- d. Fletcher

**Q.10:** If you planning a clearance in a slushy jungle strata for multistory resort, which equipment you will prefer for site clearance;

- a. Bob cat

- b. JCB
- c. Dozer
- d. Trailer

**Q.11:** Alloys having more than 2.1% carbon content are referred as:

- a. Steel
- b. Cast iron
- c. Pig iron
- d. Rought iron

**Q.12:** Minor losses in pipe flow are those

- a. Which have a small magnitude
- b. Which are caused on account of local disturbances produced by such fittings as valves, bends etc.
- c. Caused by friction and are thus also called friction losses
- d. Which depend on the length of pipeline

**Q.13:** In open channels the flow is under \_\_\_\_\_ and in pipe flow under \_\_\_\_\_

- a. atmospheric pressure, pressure higher than atmospheric
- b. atmospheric pressure, pressure lower than atmospheric
- c. atmospheric pressure, atmospheric pressure
- d. hydrostatic, atmospheric

**Q.14:** Specific Energy is given by  $E =$

- a.  $y - \frac{\alpha V^2}{2g}$
- b.  $y - \frac{V^2}{2g\alpha}$
- c.  $y + \frac{V^2}{2g\alpha}$
- d.  $y + \frac{\alpha V^2}{2g}$

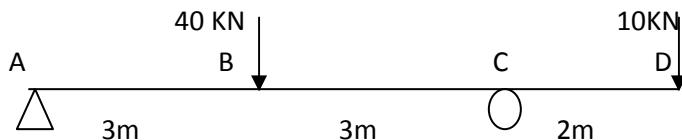
**Q.15:** Every direct stress is always accompanied by a strain in its own direction and an opposite kind of strain in every direction at right angles to it. Such a strain is known as:

- a. Linear strain
- b. Lateral strain
- c. Volumetric strain
- d. Shear strain

**Q.16:** Which of the following has highest Poisson's ratio?

- a. Rubber
- b. Steel
- c. Aluminum
- d. Copper

**Q.17:** For beam loaded as shown in figure below, what will be the location of point from A where bending moment will change sign:



- a. 2.2
- b. 3.0
- c. 5.2
- d. 5.8

**Q.18:** A plot between rainfall intensity vs time is termed as

- a. hydrograph
- b. mass curve
- c. hyetograph
- d. isohyete

**Q.19:** A barrage across a river is mainly used for:

- a. river diversion
- b. storage
- c. river diversion and storage
- d. recreation

**Q.20:** A mean annual runoff of  $1 \text{ m}^3/\text{second}$  from a catchment of area  $31.54 \text{ km}^2$  represents an effective rainfall of:

- a. 100 cm
- b. 1.0 cm
- c. 100 mm
- d. 3.17 cm

**Q.21:** If the  $BOD_5$  of waste water is 150 mg/l at  $20^\circ C$  the rate constant value is  $K = 0.23 \text{ day}^{-1}$ . The Ultimate  $BOD$  will be:

- a. 102.5 mg/l
- b. 473.7 mg/l
- c. 219.5 mg/l
- d. 47.5 mg/l

**Q.22:** Pakistan's Review of IEE and EIA Regulations, 2000; includes the listing of projects requiring IEE or EIA in its:

- a. Schedules I and II
- b. Schedules III and IV
- c. Schedules V and VI
- d. Schedules VII

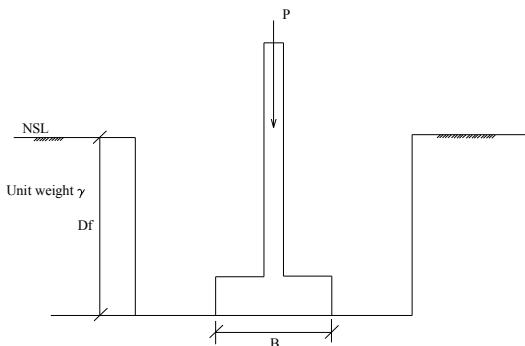
**Q.23:** The dry density of a moist soil is:

- a. Greater than the bulk density
- b. Equal to the bulk density
- c. Less than the bulk density
- d. There is no specific relation

**Q.24:** Boussinesq theory is applicable if

- a. Stress in soil is proportional to strain
- b. Stress in soil is independent of strain
- c. Stress in soil is inversely proportional to strain
- d. Stress in soil is proportional to square of the strain

**Q.25:** The figure shows a footing placed in an excavation which is not backfilled. The net allowable bearing pressure of the soil is  $q_a$ . The gross allowable bearing pressure is:



- a.  $q_a$
- b.  $q_a + \gamma Df$
- c.  $q_a - \gamma Df$
- d. None of above

**Q.26:** Railway Stations at which a railway line or one of its branch lines terminates are called:

- a. Terminal Stations
- b. Junction Stations
- c. Halt Stations
- d. None of the above

**Q.27:** An Airport Site should be selected having the property:

- a. It should be proximity to residential areas and schools
- b. Smoke and haze should be present
- c. The presence of several airports in a metropolitan area is preferred
- d. None of the above

**Q.28:** A beam is attached with three fix supports, what will be the degree of indeterminacy of the beam

- a. 0
- b. 3
- c. 6
- d. 9

**Q.29:** If crushing strength of concrete cylinder is 5345 psi, its tensile strength will be

- a. 1068.00 psi
- b. 534.50 psi
- c. 267.25 psi
- d. 178.16 psi

**Q.30:** Under application of loads on a reinforced concrete member, if steel attains maximum stress prior to the concrete member is called

- a. Over reinforced section
- b. Balanced section
- c. Under reinforced section
- d. None

## **Answers:**

- 1. a
- 2. c
- 3. c
- 4. b
- 5. d
- 6. a
- 7. b
- 8. c
- 9. c
- 10. c
- 11. b
- 12. b
- 13. a
- 14. d
- 15. b
- 16. a
- 17. c
- 18. c
- 19. a
- 20. a
- 21. a
- 22. a
- 23. c
- 24. a
- 25. a
- 26. a
- 27. d
- 28. c
- 29. b
- 30. c

# Part-III (Depth: Structures)

Total Marks/ MCQs: 40

Total Time: 3 hours

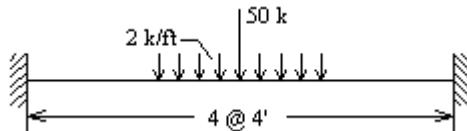
(Sample MCQs = 20)

**Q .1:** A continuous beam with two spans is to be analyzed using stiffness matrix method. If two nodes per element are to be considered, what will be the order of structural stiffness matrix?

- a. 2x2
- b. 4x4
- c. 6x6
- d. 12x12

**Q .2:** The beam shown in figure below is to be analyzed by the stiffness matrix method. Four elements are to be considered for the given beam. What will be the order of structural stiffness matrix, if only bending is to be considered:

- a. 5x5
- b. 8x8
- c. 10x10
- d. 15x15

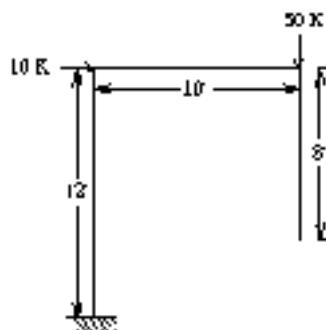


**Q .3:** Flexibility matrix method first computes

- a. Nodal displacements
- b. Reactions
- c. Member forces
- d. Member strains

**Q .4:** The frame shown in figure below is to be analyzed by the flexibility matrix method. If displacement at free tip of the frame is to be computed. What will be the order of B-matrix?

- a. 2x1
- b. 1x2
- c. 6x1
- d. 6x2

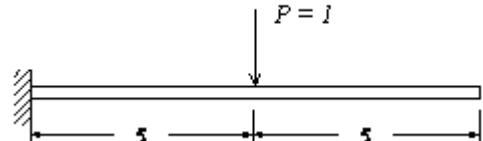


**Q .5:** Value of shape function at node being considered is equal to

- a. 0
- b. 1
- c. -1
- d. Any value

**Q .6:** If the beam shown below is to be analyzed using finite element formulation by dividing it in to two 4-node isoparametric elements, then what will be the order of structural stiffness matrix:

- a. 3x3
- b. 6x6
- c. 9x9
- d. 12x12



**Q .7:** The center to center of two rivets measured parallel to the direction of force is called:

- a. Diagonal pitch
- b. Pitch
- c. Margin
- d. Gauge line

**Q .8:** A joint in the length of column is known as

- a. Shear joint
- b. Load bearing joint
- c. Column splice
- d. Compression joint

**Q .9:** A steel angle 100x75x10 is used as tension member with longer leg connected to a 10 mm gusset plate. The connection is made with the help of lug angle. If rivet diameter is 20mm, permissible shear and bending stresses in rivet are 100MPa and 300MPa respectively, what should be the nominal diameter?

- a. 22.0 mm
- b. 21.5 mm
- c. 21.0 mm
- d. 20.5 mm

**Q.10:** For normal weight concrete if  $f'_c = 3000 \text{ psi}$ , its modulus of elasticity will be approximately equal to:

- a.  $3.15 \times 10^6 \text{ psi}$
- b.  $3.32 \times 10^6 \text{ psi}$
- c.  $3.48 \times 10^6 \text{ psi}$
- d.  $3.65 \times 10^6 \text{ psi}$

**Q.11:** According to ACI 318-95 recommendations, wind load factor is taken equal to

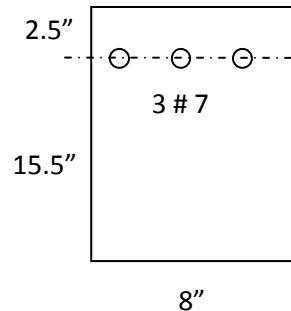
- a. 1.4
- b. 1.7
- c. 1.3
- d. 0.9

**Q.12:** Basic ideology of working stress method of design is to:

- a. Increase the loads by load factors
- b. Increase the strength of materials by factors
- c. decrease the loads by load factors
- d. decrease the material strength by factors

**Q.13:** The section of cantilever beam is shown in figure below. What is the reinforcement status?

- a. Under reinforced
- b. Balanced
- c. Over reinforced
- d. None



**Q.14:** In one way slabs loading is transferred in

- a. Short direction
- b. Long direction
- c. Either short or long direction
- d. Both short and long direction

**Q.15:** Using 40 or 50 grade steel, minimum steel ratio used to control temperature and shrinkage cracks is:

- a. 0.10%
- b. 0.15%
- c. 0.18%
- d. 0.20%

**Q.16:** Longitudinal bars required to control torsion are provided along \_\_\_\_\_ of member

- a. Bottom
- b. Top
- c. Mid
- d. Perimeter

**Q.17:** If diameter of stirrups / ties is #3, what should be the inside diameter of hook

- a. 1.5"
- b. 2.0"
- c. 2.5"
- d. 3.0"

**Q.18:** Minimum longitudinal steel % in columns is:

- a. 1 %
- b. 2 %
- c. 4 %
- d. 8 %

**Q.19:** A RC footing is to be constructed 6 ft below the grade. If allowable soil pressure is 5 ksf and self weight of soil is 100 pcf, what will be effective soil pressure at bottom of footing if depth of footing is 20":

- a. 5 ksf
- b. 4.75 ksf
- c. 4.57 ksf
- d. 4.32 ksf

**Q.20:** A 36ft span pre-tensioned simply supported beam has a rectangular cross-section, b=18", h=32". Calculate loss due to shrinkage:

Given: Prestressing force at transfer= $F_i=435k$ , are of prestressing steel  $A_{ps}=3.0\text{in}^2$ ,  $f'_c = 5\text{ksi}$ ,  $E_c=5000 \text{ ksi}$ ,  $E_s=29000 \text{ ksi}$ , profile of tendon = parabolic, eccentricity at mid span = 6", and eccentricity at ends=0

- a. 2.50%
- b. 3.66%
- c. 6.00%
- d. 7.20%

## **Answers:**

- 1.**      **c**
- 2.**      **a**
- 3.**      **c**
- 4.**      **d**
- 5.**      **b**
- 6.**      **d**
- 7.**      **b**
- 8.**      **c**
- 9.**      **b**
- 10.**      **a**
- 11.**      **c**
- 12.**      **d**
- 13.**      **a**
- 14.**      **a**
- 15.**      **d**
- 16.**      **d**
- 17.**      **d**
- 18.**      **a**
- 19.**      **d**
- 20.**      **c**