



**PUNJAB PUBLIC SERVICE COMMISSION**

**COMBINED COMPETITIVE EXAMINATION**  
**FOR RECRUITMENT TO THE POSTS OF**  
**PROVINCIAL MANAGEMENT SERVICE -2020**

**SUBJECT: PRINCIPLE OF ENGINEERING (PAPER-I)**

**TIME ALLOWED: THREE HOURS**

**MAXIMUM MARKS: 100**

**NOTE:**

- i. All the parts (if any) of each Question must be attempted at one place instead of at different places.
- ii. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
- iii. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
- iv. Extra attempt of any question or any part of the question will not be considered.

**Attempt any FIVE questions in all, calculator is allowed (not Programmable)**

**Q No. 1 a)** Explain in detail the two postulates which make up the special theory of relativity. Furthermore, explain what is "time dilation" and "length contraction".

**b)** Mention in detail what is "Superconductivity". Also explain "Meissner effect" and applications of superconductivity also Differentiate between "Reflection" and "Refraction".  
**(10 + 10 Marks)**

**Q No. 2 a)** Explain the hydrogen bonding amongst water and ice. Comment about the importance of hydrogen bonding in our ecosystem. Explain the importance of hydrogen bonding in textile materials.

**b)** Calculate the mole fraction of benzene ( $C_6H_6$ ) in solution containing 40% by mass, in carbon tetrachloride ( $CCl_4$ )  
**(10 + 10 Marks)**

**Q No. 3 a)** Differentiate between mutual and self-inductance. Also explain different cases of magnetic hysteresis. Explain the phenomenon of total internal reflection and its applications.

**b)** Discuss about the principle, construction and components of such motors which can also be used as generators.  
**(10 + 10 Marks)**

**Q No. 4 a)** Mention the key features of 2-stroke and 4-stroke diesel engine which differentiates both type of engines and list the advantages of latest type of Diesel engines which do not operate on Diesel cycle.

**b)** A two-cylinder, four-stroke petrol engine has a bore of 380 mm and a stroke of 585 mm. At 240 RPM the torque developed is 11.86 kN m. Calculate:

(i) the brake power

(ii) the brake mean effective pressure

**(10 + 2 x 5 = 20 Marks)**

**Q No. 5** Explain the composition characteristics and uses of following types of ferrous and non-ferrous materials:

i) Low-carbon steel

ii) Medium-carbon steel

iii) High-carbon steel

iv) White iron

v) High speed steel

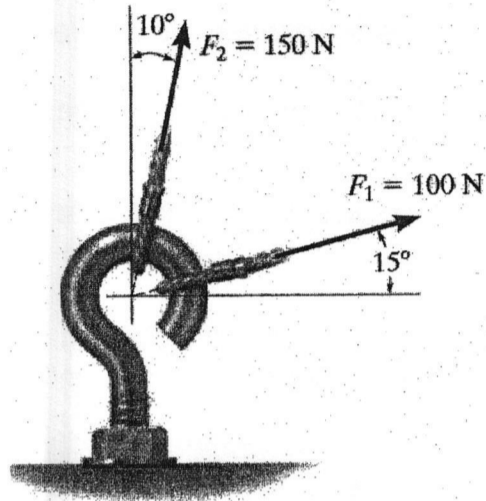
**(5 x 4 = 20 Marks)**

- Q No. 6** a) Write a note on low cost roads and low-cost housing techniques recommended in developing countries.
- b) Describe various filtration techniques used for water treatment.

**(10 + 10 Marks)**

- Q No. 7** The hook in Fig. is subjected to two forces,  $F_1$  and  $F_2$  . Determine the magnitude and direction of the resultant force.

**(20 Marks)**



- Q No. 8** Write note on following processes with the help of labelled diagrams:

- i) Machining.
- ii) Punching.
- iii) Shearing.
- iv) Stamping.
- v) Casting.

**(5 x 4 = 20 Marks)**

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# **PUNJAB PUBLIC SERVICE COMMISSION**

## **COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE -2020**

**SUBJECT: PRINCIPLE OF ENGINEERING (PAPER-II)**

**TIME ALLOWED: THREE HOURS**

**MAXIMUM MARKS: 100**

**NOTE:**

- i. All the parts (if any) of each Question must be attempted at one place instead of at different places.
- ii. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
- iii. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
- iv. Extra attempt of any question or any part of the question will not be considered.

**Attempt any five questions, in all, including question no. 08, which is compulsory. Calculator is allowed (Not programmable).**

- Q. No. 1** a) Elaborate through steps that how the operations manager can enhance the manufacturing and services of an engineering organization? **(10+10 = 20 Marks)**
- b) What is the mission of Production and operations management society (POMS)? How the global chapters of POMS are assisting the engineering professionals in improvement of their skills and expertise?
- Q. No. 2** a) Describe key features of engineering management tools used by professionals in Pakistan? **(10+10 = 20 Marks)**
- b) If employee engagement and customer relationship are considered as most effective tools by managers globally? Please explain?
- Q. No. 3** a) How decision support system of an organization can enhances the solutions of problems associated with the human resource management? **(10+10 = 20 Marks)**
- b) Sketch through a flow chart that how the decision tree can be used by managers during design of experiments for analysis of problems?
- Q. No. 4** a) Differentiate between the procedure of scheduling an engineering project using Critical Path Method and Program Evaluation Review Technique (PERT) for engineering industry in Pakistan? **(10+10 = 20 Marks)**
- b) How mathematical modeling can be used in process optimization of an engineering project? Give your reply with necessary citations?
- Q. No. 5** a) A cement manufacturing company borrows \$20,000 from a bank at a 9% annual interest rate in order to buy a machine. In addition, the company pays a \$200 loan origination fee, when the loan commences. The bank offers two repayment plans, one with equal payments made at the end of every year for the next five years and the other with a single payment made after the loan period of five years. Draw cash flow diagram for the two situations and propose suitable repayment plan that can be offered by the lender.
- b) How Microsoft Excel can be used to find the present worth for a linear gradient series? **(10+10 = 20 Marks)**
- Q. No. 6** a) The table given below shows a utility company's cost to supply a fixed amount of power to a new housing development; the indices are specific to the utilities industry. Assume that year 0 is the base period. Determine the inflation rate for each period, and calculate the average inflation rate over the three years? **(10+10 = 20 Marks)**

Year	Amount (\$)
0	504,000
1	538,400
2	577,000
3	629,500

- b) Elaborate the role of International Organization for Standardization (ISO) in sustainable quality management system of an organization?

- Q. No. 7** a) Differentiate clearly between FIFO and LIFI models of inventory management narrating merits and demerits of both? **(10+10 = 20 Marks)**
- b) Draw network diagram of the case illustrated below and perform the Critical path method (CPM) analysis?

Activity	IPA/Predecessor	Duration
A	-	2
B	A	7
C	A	10
D	A	4
E	B	6
F	B,C	5
G	C,D	8
H	D	9
I	F,G	12
J	F	5
K	E,J	5
L	G,H	6
M	F,H	4
N	I,K,L,M	3

- Q. No. 8** Choose the Right Answer: **(20 Marks)**

- Organizations can analyze decisions and systems of the projects by
  - Cost - benefit analysis
  - Benefit – cost analysis
  - Benefit costs analysis
  - All
- Software testing can be
  - Black box
  - White box
  - Both
  - None
- Testability refers to the
  - Ability to run an experiment
  - To test a hypothesis
  - To test a theory
  - All
- Most of the boundary value problems in modeling are about solving partial differential equations as
  - Two space variables
  - Three space variables
  - Both
  - None
- FEM stands for
  - Finite element method
  - Finite environment method
  - Finite electronic method
  - Finite energy method
- Multiple regression between variables can be carried out in
  - ANOVA
  - SPSS
  - MS Excel
  - All
- Gantt charts can be developed in
  - MS Project
  - Primavera
  - Both
  - None
- Macroeconomics deal with
  - Interest rate
  - National productivity
  - Large scale economics factors
  - All
- The main model of price determination used in economic theory
  - Supply and demand
  - Supply only
  - Demand only
  - None
- A state of limited competition in which market is shared by small number of producers or sellers is
  - Oligopoly
  - Minopoly
  - Pligopoly
  - Zligopoly
- PDCA cycle in Quality Management System stands for
  - Plan do check acquire
  - Plan do check act
  - Plan do charge act
  - Plan do charge acquire
- Internal node of decision tree represents
  - Test on an attribute
  - Label on an attribute
  - Cost on an attribute
  - Duration on an attribute
- Inventory management is the part of
  - Supply chain management
  - Needed materials
  - Products
  - All

14. The most important resource to be managed by the management is
  - a. Manpower
  - b. Machinery
  - c. Money
  - d. Materials
15. Inventory management is the supervision of
  - a. Non capitalized assets
  - b. Inventory
  - c. Stock items
  - d. All
16. ISO 14000 is about
  - a. Contract management
  - b. Environment management
  - c. Sustainability management
  - d. Process management
17. In MS Project / Primavera software the type of relationship between activities can be
  - a. Finish to Finish
  - b. Top to top
  - c. Bottom to bottom
  - d. All
18. Direct expenses are
  - a. Carriage inward
  - b. Carriage outward
  - c. Carriage forward
  - d. All
19. The five E's of industrial work safety include
  - a. Enhancement Effectiveness Establishment Encouragement Evaluation
  - b. Engineering Enhancement Enforcement Encouragement Evaluation
  - c. Engineering Education Enforcement Encouragement Evaluation
  - d. None of these
20. The activity with zero duration is called as
  - a. Critical
  - b. Non critical
  - c. Dummy
  - d. Float

