# PUNJAB PUBLIC SERVICE COMMISSION

## COMBINED COMPETITIVE EXAMINATION 2017
## FOR RECRUITMENT TO THE POSTS OF
## PROVINCIAL MANAGEMENT SERVICE, ETC.

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

**TIME ALLOWED:** THREE HOURS **MAXIMUM MARKS:** 100

**NOTE:** **Attempt Any FIVE Questions in All. Calculator is Allowed (not programmable).**

**Q No.1:** a) Explain in detail the Pauli Exclusion Principal and Heisenberg Uncertainty Principal.

b) What is Plank's constant? Explain its significance. Discuss Wave-Particle Duality and its applications.

**(10+10 Marks)**

**Q No.2:** a) Differentiate between ideal and non-ideal solution. State the Boyle's law and Charles's laws.

b) Calculate the Molarity of the solution having 60 g of Co $(NO_3)_2.6H_2O$ in 4.3 L of solution.

**(10+10 Marks)**

**Q No.3:** a) What is the difference between induction motor and synchronous motor, write down their speed and Torque relations.

b) A 24 V permanent magnet DC motor having coil resistance of 2 ohms is developing a back emf of 22.5 volts when driving the load at normal speed. Find the value of current

(i) at startup
(ii) when the motor is running at normal speed.

**(10+10 Marks)**

**Q No.4:** Determine the moment of 100 N force about point O in Fig.1

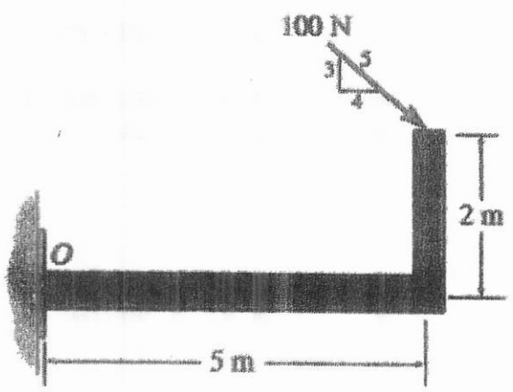


Fig. 1

**(20 Marks)**

**P.T.O**

**Q No.5:** a) Discuss in detail working and classification of amplifier. What are the RC oscillators, write down their few applications?

b) A simply biased transistor circuit is shown in Fig. 2. The required quiescent values for base current and base-emitter voltage are 60 μ A and 0.8 V respectively. Determine a suitable value for resistor $R_B$.

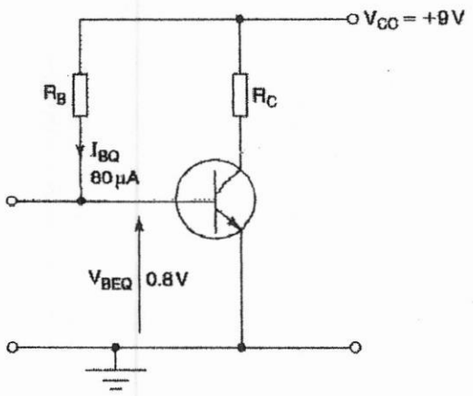


Fig. 2

**(10+10 Marks)**

**Q No.:6** a) State the 2nd law of thermodynamics and describe the difference between 2-stroke and 4-stroke engines.

b) A 4-stroke single cylinder engine has the cylinder diameter 50.8 mm and length of stroke 76.2 mm.

i) Find its swept volume (cc of the engine)
ii) If its clearance volume is 20 $cm^3$. Find its compression ratio.

**(10+10 Marks)**

**Q No.7:** a) Write a note on Amorphous materials. What kind of Metallic Crystal Structures are found in the case of solids

b) Explain the use of ceramic materials in engineering, also discuss the Mechanical and Thermal properties of industrial engineering ceramics.

**(10+10 Marks)**

**Q No.8:** a) Discuss the environmental impacts on water resources projects.

b) Explain the advantages and disadvantages of impulse water turbine and reaction water turbines

**(10+10 Marks)**

# PUNJAB PUBLIC SERVICE COMMISSION

## COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE-2019

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

**TIME ALLOWED: THREE HOURS** **MAXIMUM MARKS: 100**

**NOTE: Attempt Any FIVE Questions in All. Including Question No. 8 which is Compulsory. Calculator is allowed. (Not Programmable)**

Q No. 1: a) Define following:

1. Net present value
2. Book and Salvage values
3. Fixed and variable costs
4. Internal Rate of return
5. Opportunity cost

b) Explain benefit cost (B/C) ratio and break even point for a project.

**(10+10=20 Marks)**

Q No. 2: a) What are predecessor and successor activities? Also, define earliest time, latest time and slack time.

b) The activity chart for a plant repair project along with precedence and estimate of activity times is given below. Develop a PERT network, determine the critical path and activity schedule along with slack times.

| Activity | Duration (days) | Precedence |
|---|---|---|
| A | 2 | - |
| B | 8 | a |
| C | 7 | a |
| D | 5 | a |
| E | 6 | b |
| F | 11 | c |
| G | 4 | c,d |
| H | 5 | e |
| I | 10 | f |
| J | 3 | f |
| K | 8 | g |
| L | 7 | h,i,j |
| M | 14 | k |
| N | 4 | l,m |

**(10+10=20 Marks)**

Q No. 3: a) Define, sketch and explain economic order quantity. Also, develop basic formula for economic order quantity.

b) A home appliance manufacturing company has an annual requirement of 12000 thermostats. The unit price is Rs. 1200. If the quantity of a single lot exceeds 1000, a quantity discount of 2% is available. If the cost of an order is Rs. 3000 and the inventory holding cost is 24% per annum, what should be the lot size for a minimum total cost per unit? **(10+10=20 Marks)**

Q No. 4: a) Define and explain prevention, appraisal, internal/external failure costs.

b) List quality management ideas of Deming, Juran and Crosby. How can these ideas be helpful in building a quality management system? **(10+10=20 Marks)**

Q No. 5: a) Explain Job production, Batch production, continuous production, mass production and group technology.

b) Elaborate Just-in-Time (JIT) production system with clearing stating its constraints and benefits. **(10+10=20 Marks)**

Q No. 6: a) Define and Explain Maximax and Maximin decision making under uncertainty.

b) Elaborate following:

1. Cause-and-Effect diagram
2. Pareto diagram
3. Control chart
4. Process capability
5. Scatter diagram

**(10+10=20 Marks)**

Q No. 7: a) Compare authoritarian, supportive, consultative and Japanese styles of management.

b) What are basic principles of production management to improve product, process and plant along with efficient human resource utilization? **(10+10=20 Marks)**

**Q No. 8: Choose the right answer and mark it with Tick. (20 Marks)**

I. Current assets - current liabilities =
   a) Working capital
   b) Current value of the firm
   c) Share value index
   d) Turn over

II. A machine costing Rs. 8500 will have a scrap value of Rs. 300. Machines of this class have a working hour average life of 25000 hours. What will be the depreciation charge at the end of the first year if the machine is operated for a total duration of 1500 hours?
   a) Rs. 492.00
   b) Rs. 542.00
   c) Rs. 548.50
   d) Rs. 692.00

III. Jobs going behind the schedule are conveniently shown in
   a) Milestone chart
   b) pi chart
   c) Bar chart
   d) Gantt chart

IV. An organization may decide to buy a component from outside when
   a) existing production facilities are limited
   b) there is need to maintain stability in employment
   c) cost is less to buy as compared to production cost
   d) All of the above

V. Choose the correct statement

a) CPM and PERT are event oriented techniques

b) CPM and PERT are activity oriented techniques

c) CPM is an activity oriented technique while PERT is an event oriented technique

d) None of the above

VI. Which of the following were not management thinkers

a) Taylor

b) Galileo

c) Drucker

d) McGregor

VII. A military organization is known as

a) Committee

b) Line organization

c) Line and staff organization

d) Functional organization

VIII. Machine loading means

a) Load of machine + load of heaviest job that machine can take

b) Load of machine + load of heaviest job that machine can take

c) Electrical load required for the machine motors

d) Amount of work assigned to a machine

IX. The advertisement cost is included

a) In fixed cost

b) Sometimes in fixed cost and sometimes in variable costs

c) Always in variable costs

d) Never included in variable costs

X. Which of the following is not wealth?

a) Office building

b) Goodwill of a firm

c) Services of a consultant

d) Water in sea

XI. Control limits are

a) Limits defined by customers

b) Limits driven by the natural variability of the process

c) Limits driven by the inherent variability of the process

d) Statistical limits

XII. Which one of these is not a component of quality?

a) Reliability

b) Durability

c) Acceptance sampling

d) Serviceability

XIII. How many points did Deming give to elaborate methods for quality improvement?

a) 23
b) 14
c) 12
d) 10

XIV. In 3-σ quality performance, the probability of producing a conforming product is

a) 1.0000
b) 0.9973
c) 0.9500
d) 0.9467

XV. Probability distribution relates the value of a variable to

a) Its probability of occurrence
b) Probability of occurrence of values other than that
c) Its frequency
d) Random variable

XVI. An uncertain event or condition that, if it occurs, has a positive or negative effect on a project objectives is termed.

a) Random chance
b) Uncertainty
c) Risk
d) Hazard

XVII. Detailing all identified risks, including descriptions, category, and probability of occurring, impact, responses, contingency plans, owners and current status is called

a) Management reserves
b) Contingency reserves
c) Change control
d) Risk register

XVIII. The assessment of the external and internal environments is called

a) SWOT analysis
b) Competitive analysis
c) Industry analysis
d) Market analysis

XIX. In work study the symbol D implies

a) Delay
b) Transport
c) Operation
d) Inspection

XX. A product layout is generally suggested for

a) Jobbing work
b) Batch production
c) Continuous type of production
d) Efficient machine utilization ratio