

B.Tech. (ME) 7th Semester (Scheme-G)

Examination, December-2025

DESIGN OF MACHINE ELEMENT-II

Paper-PCC-ME-401-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt five questions in all. Question No. 1 is compulsory. Attempt four more question from the Sections-A, B, C & D by selecting at least one question from each section.

1. (a) What do you mean by casting ? $6 \times 2.5 = 15$
(b) Define surface factor.
(c) What do you mean by deflection ?
(d) What is fluctuating stress ?
(e) What do you mean by hydrodynamic lubrication ?
(f) Explain applications of springs.

Section-A

2. Explain the design issues that have to be considered when designing a component for machining, forging and casting. How does general design and performance of the component depend on the features of every production technique ? 15

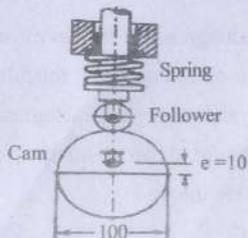
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[P.T.O.]

3. Describe variable loading and how it affects fatigue strength. Discuss various forms of fluctuating stress that a component might face and explain how fatigue life is influenced by factors such as stress concentration, surface texture, and size. 15

Section-B

4. An eccentric cam, 100 mm in diameter, rotates with an eccentricity of 10 mm as shown in Fig. The roller follower is held against the cam by means of a helical compression spring. The force between the cam and the follower varies from 100 N at the lowest position to 350 N at the highest position of the follower. The permissible shear stress in the spring wire is recommended as 30% of the ultimate tensile strength. Design the spring from static considerations and determine the factor of safety against fluctuating stresses. Neglect the effect of inertia forces.



5. Explain methods to design a shaft for static and dynamic loads. Discuss fatigue, deflection, and stiffness as shaft design considerations. 15

Section-C

6. Explain the various forms of lubrication used in bearings. Describe the operating conditions under which each type of lubrication takes place as well as the advantages and drawbacks of each. 15
7. The following data is given for a 360° hydrodynamic bearing :

Radial load = 3.2 kN; journal speed = 1490 rpm; journal diameter = 50 mm; bearing length = 50 mm; radial clearance = 0.05 mm; viscosity of lubricant = 25 cP. Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing. Calculate :

- coefficient of friction
- power lost in friction
- minimum oil film thickness

Section-D

8. Classify gears. Discuss the process of selecting gears for a mechanical drive system based on various design parameters. 15
9. Discuss the Lewis form factor (or Lewis factor) for gear teeth and its application in gear design. Using the Buckingham and Barth Equations, describe the dynamic stress on gear teeth.

B.Tech. (ME) 7th Semester (Scheme-G)

Examination, December-2025

ENTREPRENEURSHIP DEVELOPMENT

Paper-PCC-ME-403-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt five questions in all. Question No. 1 is compulsory. Attempt four more questions from the Sections-A, B, C & D by selecting at least one question from each section.

1. (a) What do you mean by economic development ?
- (b) Explain project planning and scheduling.
- (c) What do you mean by EDP Programmes ?
- (d) What are qualities of entrepreneurs ?
- (e) What do you mean by MSMEs ?
- (f) Explain SIDO. 6×2.5=15

Section-A

2. Explain the factors affecting entrepreneurial growth.
Discuss both economic and non-economic factors. 15
3. Discuss the key traits and qualities of an entrepreneur.
How do these traits contribute to their success ? 15

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Section-B

4. Discuss the importance and steps involved in conducting a feasibility study for a new product. Also, discuss about various essential elements involved in launching a new product. 15
5. Discuss the various sources of finance available to entrepreneurs for starting and growing their businesses. 15

Section-C

6. Examine the importance of MSMEs in the Indian economy, the governmental initiatives aimed to promote them, and the hurdles faced in accessing these initiatives. 15
7. Discuss the process for starting a small business in India. What are the procedures for registering the firm and acquiring a NOC from the Pollution Control Board? 15

Section-D

8. Examine the function of support institutions in the administration of small enterprises in India. Discuss the roles of the Director of Industries and the District Industries Centre (DIC). 15

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9. Discuss the concepts of venture capital and the financing plans provided by major financial institutions in India. 15

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**B.Tech. (ME)-PEC-II 7th Semester (Scheme-G)
Examination, December-2025**

REFRIGERATION & AIR CONDITIONING

Paper-PEC-ME-401-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt five questions in all. Question No. 1 is compulsory. Attempt four more questions from the Sections-A, B, C & D by selecting at least one question from each section.

1. (a) What do you mean by cryogenics? $6 \times 2.5 = 15$
- (b) Explain Brayton refrigeration cycle.
- (c) What are the limitations of reversed Carnot cycle ?
- (d) Explain Infiltration and ventilation.
- (e) What do you mean by psychrometry ?
- (f) What are the dehumidifying coils ?

Section-A

2. What are the desirable properties of an ideal refrigerant ?
Compare and contrast commonly used refrigerants in terms of these properties. 15

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3. Discuss the necessity of cooling in aircraft. How do air refrigeration systems address the challenges of maintaining temperature in high-altitude environments? 15

Section-B

4. An air-conditioned room requires $30 \text{ m}^3/\text{min}$ of air at 1.013 bar, 20°C , 52.5% RH. The steady flow conditioner takes in air at 1.013 bar, 77% RH, which it cools to adjust the moisture content and reheats to room temperature. Find the temperature to which the air is cooled and the thermal loading on both the cooler and heater. Assume that a fan before the cooler absorbs 0.5 kW, and that the condensate is discharged at the temperature to which the air is cooled. 15
5. Evaluate the performance, merits, and demerits of vapour absorption refrigeration systems. In what scenarios are these systems more advantageous than vapour compression systems? 15

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Section-C

6. Determine the properties of moist air and define the following terms : degree of saturation, relative humidity, Gibbs-Dalton Law, specific humidity, and dew point temperature. In the context of air conditioning how are these characteristics related? 15
7. What are the sources of heating and cooling loads in an air-conditioned space, and how do these loads affect the design and operation of HVAC systems? 15

Section-D

8. Describe the components and layout of an air distribution system. Discuss the design and function of duct systems, including factors such as airflow, duct sizing, and pressure losses. 15
9. Explain the different types of refrigeration and air-conditioning compressors, along with their working principles, uses and performance curves. 15

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B.Tech. (ME)-PEC-III 7th Semester (G-Scheme)

Examination, December-2025

SOLAR ENERGY ENGINEERING

Paper-PEC-ME-411-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt five questions in all. Question No. 1 is compulsory. Attempt four more questions from the Sections-A, B, C & D by selecting at least one question from each section.

1. (a) What do you mean by solar system ? $6 \times 2.5 = 15$
- (b) Explain solar lighting systems.
- (c) What do you mean by solar bonds ?
- (d) What is passive cooling system ?
- (e) What do you mean by green house effect ?
- (f) What are the applications of solar energy ?

Section-A

2. Describe the geometric relationship between the Sun and Earth, including the concepts of Earth-Sun angles such as declination, hour angle, and solar zenith angle. 15

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3. Explain steady state heat transmission. Discuss in details the periodic heat transfer through walls and roofs. 15

Section-B

4. Explain the design and operational aspects of solar-powered pumps. What are the key factors influencing their performance? 15
5. Discuss grain solar drying methods and technologies. What is the efficiency and quality preservation of sun drying compared to traditional drying techniques? 15

Section-C

6. Explain the concept of an intermittent solar absorption refrigeration system. How does it operate, and what are the benefits of using such a system in off-grid locations? 15
7. What are the different absorbent-refrigerant combination? What are the various factors influencing the selection of absorbent-refrigerant combinations. 15

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Section-D

8. Discuss the working principles of photovoltaic (PV) solar cells and their role in solar electric conversion systems. 15
9. Evaluate the economic implications of transitioning from conventional fossil fuels to solar electric systems. What are the potential benefits and challenges associated with this transition? 15

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