EVEN 2025-26

RT22402

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : Rubber Technology (Sandwich Pattern)
Course Title : Rubber Compounding and Production Testing

2:30 Hours/ 60 marksEnrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the role of ASTM in rubber. **[CO-1, L-R]**
b. State the term Rebound Resilience. **[CO-1, L-R]**
c. State the importance of testing in rubber **[CO-2, L-R]**
d. State the parameters to measure abrasion test. **[CO-2, L-R]**
e. Define flame resistance. **[CO-3, L-R]**
f. State the function of OD2 and MOR. **[CO-3, L-R]**
g. Enlist the test performed on vulcanised rubber. **[CO-4, L-R]**
h. State the term heat ageing. **[CO-5, L-R]**
i. List out various raw material test of rubber. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain how degree of vulcanization affects the physical properties of rubber. **[CO-1, L-A]**
b. Explain significance of having chemical and environmental testing in rubber industry. **[CO-2, L-U]**
c. Explain the plasticity retention index and its measurement. **[CO-3, L-U]**
d. Explain water absorption test. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain test on electrical conducting and anti-static rubbers. **[CO-2, L-U]**
b. Explain the procedure of moisture content test. **[CO-3, L-U]**
c. Explain test procedure for volume swelling. **[CO-4, L-U]**
d. Explain how temperature and humidity affect on rubber material. **[CO-6, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain the various environmental factors that impact durability of rubber. **[CO-1, L-R]**
b. State the term i) Repeatability ii) Accuracy iii) Precision . **[CO-3, L-R]**
c. Explain importance of hysteresis and damping properties in dynamic application **[CO-4, L-U]**
d. Explain the role of quality control in rubber testing. **[CO-5, L-R]**

c. Justify : Addition of carbon black improves environmental resistance in rubber. [CO-6,L-U]

Q.5 Attempt any TWO **12 Marks**

a. Explain dead load test and durometer test of rubber. [CO-4, L-U]

b. Explain the role of stabilizer antioxidants and antiozonants in extending the life of rubber products. [CO-5, L-U]

c. Explain constant volume method for testing of gas permeability. [CO-6, L-U]

****End****

EVEN 2025-26

RT22201

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Polymer Science**

2:30 Hours/ 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO -COURSE OUTCOMES, L- LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define co polymer with example. **[CO-1, L-R]**
b. Give two examples of synthetic polymers. **[CO-1, L-U]**
c. Define cross linked polymer with example. **[CO-2, L-R]**
d. Write two type of polymerisation. **[CO-3, L-U]**
e. Define polyaddition polymerisation with example. **[CO-3, L-R]**
f. Name any two polymerisation techniques. **[CO-4, L-U]**
g. Define degree of crystallinity. **[CO-5, L-R]**
h. Define glass transition temperature. **[CO-5, L-R]**
i. List any two type of polymer degradation. **[CO-6, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. Distinguish between Natural and synthetic polymer. **[CO-1, L-A]**
b. Explain free- Radical polymerization with example. **[CO-3, L-R]**
c. Write difference between Bulk polymerisation and solution polymerisation. **[CO-4, L-U]**
d. Discuss Thermal degradation with example. **[CO-6, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain Average molecular weight. Write its formula. **[CO-1, L-A]**
b. Write the difference between polymerisation & polyaddition polymerisation. **[CO-2, L-U]**
c. Explain electrochemical polymerisation with reaction. **[CO-3, L-U]**
d. Write difference between bulk polymerization and solution polymerization. **[CO-4, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Define the term with example i) Homopolymer ii) Terpolymer. **[CO-2, L-R]**
b. Write difference between Random polymer and block polymer. **[CO-2, L-U]**
c. Explain mass polymerization techniques. **[CO-4, L-U]**
d. Explain suspension polymerization. **[CO-4, L-U]**
e. Write types of polymer degradation with example. **[CO-6, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain the following term
   i) Free-radical polymerization.
   ii) Ionic polymerization **[CO-3, L-A]**

b. Define crystallites & explain various effect of crystallinity on the properties of polymer. **[CO-5, L-U]**

c. Explain degradation by ultra-sonic waves & mechanical degradation. **[CO-6, L-U]**

****End****

EVEN 2025-26 **RT22304**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology**
Course Title : **Rubber Machinery.**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO-COURSE OUTCOMES, L- LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State any two application of calenders. **[CO-2, L-R]**
b. Define the friction ratio of two roll mill. **[CO-1, L-R]**
c. Give any two applications of autoclave. **[CO-6, L-R]**
d. Enlist the types of heads in extruders. **[CO-3, L-R]**
e. Define roll cambering. **[CO-2, L-R]**
f. Define principle of extruders. **[CO-3, L-R]**
g. Define the following terms i) De flashing
ii) Blank heating methods **[CO-4, L-R]**
h. List out any two equipment's used for tank and pipe lining. **[CO-5, L-R]**
i. Enlist the parts of two roll mill. **[CO-1, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Differentiate between hot and cold extruders. **[CO-3, L-A]**
b. Give advantage and disadvantages of compression moulding along with diagram. **[CO-4, L-A]**
c. Enlist the different equipment's required for tank and pipe lining and explain briefly any one of them. **[CO-5, L-U]**
d. Sketch and label two roll mill with its principle. **[CO-1, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Enlist the different new development ongoing in vulcanization equipment's with their advantages and disadvantage. **[CO-6, L-U]**
b. State and explain injection moulding with neat labeled diagram. **[CO-4, L-U]**
c. Explain Tandem mixing. **[CO-1, L-A]**
d. Differentiate between compression and transfer moulding. **[CO-4, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Enlist the types of calendars and their advantages. **[CO-2, L-A]**

b. Sketch and explain transfer moulding. **[CO-4, L-A]**

c. Explain the term roller covering. **[CO-5, L-U]**

d. Describe briefly about molten salt bath. **[CO-6, L-U]**

e. State and explain i) Roll cambering
ii) Friction coating. **[CO-2, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. i) Enlist the different curing method with their significance.
ii) State and explain autoclave with neat diagram. **[CO-6, L-U]**

b. Sketch and explain briefly i) Ram type extruder
ii) Screw type extruder. **[CO-3, L-U]**

c. i) Explain briefly about mixing mill
ii) Differentiate kneaders and banbury mixer. **[CO-1, L-U]**

****End****

RT22303

BVEN 2025-26

POLYTECHNIC MUMBAI

TERM END EXAMINATION

Programme : Rubber Technology (Sandwich Pattern)
Course Title : General Purpose Rubber

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX — **12 Marks**

a. List out conventional grades of natural rubber. **[CO-1, L-R]**
b. State the name of trees which produce natural rubber. **[CO-1, L-R]**
c. State the end use applications of Isoprene rubber. **[CO-2, L-R]**
d. Write the effect of flexibility of SBR with increasing styrene content. **[CO-3, L-R]**
e. State the properties of Butyl rubber. **[CO-5, L-R]**
f. List down copolymer rubber. **[CO-5, L-R]**
g. State the major uses of reclaimed rubber. **[CO-6, L-R]**
h. Define digester process in reclaiming. **[CO-6, L-R]**
i. Which gases are used in cryogenic process. **[CO-6, L-R]**

Q.2 Attempt any THREE — **12 Marks**

a. Explain the process of making R.S.S sheet. **[CO-1, L-U]**
b. Compare natural rubber and polyisoprene rubber **[CO-2, L-A]**
c. Explain strain and stress crystallization in rubber. **[CO-3, L-U]**
d. Draw the different isomerism of BR rubber. **[CO-4, L-U]**

Q. 3 Attempt any THREE — **12 Marks**

a. Explain about TSR and give 3 limitations of NR. **[CO-1, L-U]**
b. Explain how selection of initiator effect the structure property of IR. **[CO-2, L-U]**
c. Explain the effect of styrene content on the properties of SBR rubber. **[CO-3, L-A]**
d. Explain the process of making crepe rubber. **[CO-6, L-A]**

Q. 4 Attempt any FOUR — **12 Marks**

a. Explain the process of topping of natural rubber. **[CO-1, L-U]**
b. Explain the advantages of latex in brief. **[CO-2, L-U]**
c. Differentiate cold SBR and hot SBR. **[CO-3, L-A]**
d. Compare TSR and ADS. **[CO-4, L-A]**
e. Explain field latex rubber. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. List the [illegible] **[CO-4, L-A]**

b. Explain manufacturing process of IIR. **[CO-5, L-U]**

c. Describe process of reclaiming and advantages of reclaimed rubber and its application areas. **[CO-6, L-U]**

EVEN 2025-26 **RT22502**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology**
Course Title : **Reverse Engineering & Analysis of Rubber Products**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the term solvent extraction. **[CO-1, L-R]**
b. List the chemical methods used in rubber reverse engineering. **[CO-2, L-R]**
c. Compare Acrylonitrile and Acrylic rubber (Any two points) **[CO-3, L-U]**
d. State the various detectors used in Gas chromatograph. **[CO-3, L-R]**
e. State the applications of DSC. **[CO-4, L-R]**
f. List out three polymers flame resistance. **[CO-4, L-R]**
g. State the principle of thermogravimetic. **[CO-5, L-R]**
h. Explain the role of thermal analysis in polymer. **[CO-5, L-R]**
i. Define addition polymerization. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain the technique which is used to separate the rubbers from the fillers and its quantitative analysis. **[CO-2, L-U]**
b. Explain the composition of C_A, C_N and C_P in aromatic Napthali Nic/ paraffin oil in % **[CO-3, L-A]**
c. State the characteristics of polymer identification in three methods FTIR/ T GA/ DSC. **[CO-4, L-U]**
d. Explain emulsion polymerization is used in the synthesis of latex. **[CO-6, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. How does chromatography HPLC or GC contribute to the identification of organic additives in rubber. **[CO-2, L-U]**
b. State the advantages of FTIR over infrared spectroscopy. **[CO-3, L-A]**
c. Explain the importance of crosslinking in rubber blends for high temperature applications. **[CO-4, L-U]**
d. Compare melting temperature (Tm) and glass transition temperature in polymer. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain the importance of muffle furnance in rubber technology. **[CO-1, L-R]**

b. Explain the role of pyrolysis in rubber reverse engineering. **[CO-2, L-R]**

c. State the advantages of rubber composites over pure rubber materials. **[CO-4, L-U]**

d. State the term thermogravimetric analysis. **[CO-5, L-R]**

e. Explain the role of flam retardants in polymer. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain how ash content analysis can be used to determine the quality of rubber product, also give its importance in recycling rubber materials. **[CO-1, L-U]**

b. i) Explain Role of HPLC in analyzing rubber additives. **[CO-3, L-U]**
ii) State Principle of GPC and its use in determining molecular weight. **[CO-3, L-R]**

c. Explain the method of solvent exchange used in polymer isolation and purification. **[CO-6, L-U]**

****End****

EVEN 2025-26 **RT22302**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Rubber Physics**

2:30 Hours / 60 marks Enrolment No. | | | | | | | |

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the terms i) Stress ii) Strain. **[CO-1, L-R]**
b. State the Hook's law. **[CO-1, L-R]**
c. State the relation between bulk modulus and young modulus. **[CO-1, L-R]**
d. State various types of time dependency in polymers. **[CO-2, L-R]**
e. Compare Maxwell model and four parameter model (two points). **[CO-3, L-R]**
f. State the use of Rheometer. **[CO-4, L-R]**
g. State the working principle of mooney viscometer. **[CO-4, L-R]**
h. State Gibb's free energy equation. **[CO-5, L-R]**
i. State electrical properties of polymers. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain material response time. **[CO-3, L-A]**
b. State the terms PRI and RPN with its importance in rubber industry. **[CO-4, L-A]**
c. State the concept of swelling using first principle of thermodynamics. **[CO-5, L-U]**
d. Explain rebound resilience with its properties. **[CO-6, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain thermo plasticity and how does it beneficial for processing of polymers. **[CO-1, L-U]**
b. Explain voight kelvin model and how stress strain properties calculated using this model. **[CO-3, L-U]**
c. Explain theta solvent and theta temperature. **[CO-5, L-U]**
d. With neat sketch explain hysteresis and state its importance in rubber industry. **[CO-6, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. State Pascal's law and explain pascalion fluid. **[CO-2, L-U]**
b. Explain the radius of gyration. **[CO-3, L-U]**
c. State the terms i) Abrasion resistance ii) Permeability. **[CO-5, L-U]**
d. Define creep. State the product name where it is observed. **[CO-5, L-U]**
e. State the permeability of gas in polymer. **[CO-6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain viscoplastic fluid behavior method in brief. **[CO-2, L-A]**
b. Explain super position principle with require graph. **[CO-3, L-U]**
c. With the help of neat diagram explain the measurement of plasticity, retention index in rubbers. **[CO-4, L-A]**

****End****

EVEN 2025-26 **AM22306**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : Rubber Technology
Course Title : Strength of Material

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the Hooke's law. **[CO-1, L-R]**
b. Define Modulus of Elasticity with its unit. **[CO-1, L-R]**
c. Define factor of safety. **[CO-2, L-R]**
d. Define Poisson's ratio. **[CO-2, L-R]**
e. Define radius of gyration. **[CO-3, L-R]**
f. List out types of beams and types of loads. **[CO-4, L-R]**
g. State the term torsional rigidity. **[CO-5, L-R]**
h. State the term of eccentric load. **[CO-6, L-R]**
i. Define Bending stress and axial stress. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. A circular bar of cross-sectional area 200 mm^2 is axially pulled by a force 50 KN as shown in fig.1. Find the value of P and total elongation. Take E = $2x10^5$ N/mm^2. **[CO-1, L-A]**
b. Derive the relation between modulus of elasticity, modulus of rigidity and bulk modulus. **[CO-2, L-A]**
c. State the assumptions made in theory of pure torsion. **[CO-5, L-U]**
d. A simply supported beam as shown in fig.2. Draw SFD and BMD. **[CO-4, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. A circular hole of 20 mm diameter is to be punched in a mild steel plate of 5 mm thickness if shearing stress developed in the metal is 180 MPa. Find the force required to punch the hole. **[CO-2, L-A]**
b. Draw and state the formula of M.I. for i) Hollow rectangular section ii) Hollow circular section. **[CO-3, L-A]**
c. State the expression for torsional resistance of (i) Hollow Circular Shaft (ii) Solid Circular Shaft **[CO-5, L-A]**
d. Discuss the middle third rule for a rectangular section. **[CO-6, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. A steel rod 4.5 m long is at temperature 28°C. The maximum temperature is expected 78 °C. Determine free expansion of the rod and find temperature stress. Take $E = 2x10^5$ N/mm^2, $\alpha = 12x10^{-6}$/ °C. **[CO-1, L-A]**

b. Discuss a stress-strain diagram for ductile material with neat sketch. **[CO-2, L-U]**

c. Discuss the parallel axis theorem and perpendicular axis theorem of M.I.. **[CO-3, L-U]**

d. Explain the term 'No tension condition' or 'Zero tension'. **[CO-6, L-A]**

e. A simply supported beam of span 4 m is subjected to two points loads of 10 KN and 20 KN at 1 m and 3 m from left end respectively. Draw SFD and BMD diagram. **[CO-4, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. A symmetrical I section as shown in fig.3. Calculate MI about its centroidal axis parallel to the flanges. **[CO-3, L-A]**

b. A cantilever beam of span 2.5 m long carries three point loads of 1 KN, 2 KN and 3 KN at 1 m, 1.5 m and 2.5 m from the fixed end. Draw SFD and BMD. **[CO-4, L-A]**

c. A tensile test is carried out on mild steel bar of 20 mm diameter with 50 mm gauge length. The bar yields under load of 20 KN. It reaches maximum load of 40KN and breaks at 25 KN. Estimate; (a) Yield Strength (b) Ultimate Strength (c) Ruture Strength (d) Actual Strength. **[CO-1, L-A]**

****End****

EVEN 2025-26 **RT23201**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Polymer Science**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES; L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the use of inhibitor. **[CO-1, L-R]**
b. State the physical form of polymer achieved by suspension polymerization **[CO-1, L-R]**
c. Define fibres with examples. **[CO-2, L-R]**
d. Give two examples of emulsifier molecules. **[CO-3, L-R]**
e. Define Oligomer where it is used. **[CO-3, L-R]**
f. State ring structure in molecules State one monomer molecule with ring Structure. **[CO-4, L-R]**
g. Define modulus State its unit of measurement. **[CO-5, L-R]**
h. Compare homopolymers and copolymers (two points) **[CO-5, L-R]**
i. State condensation reaction. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. State Glass transition and explain the factors that affect this property. **[CO-1, L-R]**
b. Explain the process of coagulation in NR latex & where it is used. **[CO-2, L-U]**
c. Explain solution polymerization Give its demerits and merits. **[CO-4, L-U]**
d. Define biodegradation Name any two polymers that are bio-degradable. **[CO-2, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. With a neat diagram explain linear and cross linked polymer. **[CO-2, L-A]**
b. Explain the various types of copolymers. **[CO-3, L-U]**
c. Explain Emulsion polymerization with its advantages. **[CO-5, L-U]**
d. Explain oxidative degradation and mechanism of antioxidants. **[CO-6, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. State free radical and it use in polymer industry. **[CO-1, L-U]**

b. List the major types of molecular weight measurements in polymer. **[CO-2, L-R]**

c. Polymers do not have boiling point give reason. **[CO-3, L-U]**

d. Give any two example of catalyst used in the manufacturing of PP. **[CO-4, L-R]**

e. Draw the structure of linear branched and cross linked types of polymers **[CO-6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain with neat diagram any one method of classification of polymers state examples for each class. **[CO-3, L-A]**

b. State weight average molecular weight and how it is calculated. **[CO-4, L-U]**

c. Explain the process of ring opening polymerization with example Give its advantages. **[CO-6, L-U]**

****End****

EVEN 2025-26 **RT23304**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Rubber Machinery**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 **Attempt any SIX** **12 Marks**

a. Define friction ratio in mixing mill. **[CO-1, L-R]**
b. State the working principle of tandem mixer. **[CO-1, L-R]**
c. Name the different type of calenders. **[CO-2, L-R]**
d. Define the term ' Roll bending' **[CO-2, L-R]**
e. Differentiate Ram type and screw type extruders. **[CO-3, L-R]**
f. Define Diswell and give its significance. **[CO-3, L-R]**
g. Enlist two moulding machines used in rubber industry. **[CO-4, L-R]**
h. Enlist the advantages of fluidized bed. **[CO-6, L-R]**
i. State the working principle of microwave curing. **[CO-6, L-R]**

Q.2 **Attempt any THREE** **12 Marks**

a. Differentiate between internal mixer and banbury mixer. **[CO-1, L-U]**
b. Explain pin barrel and dual feed extruder **[CO-3, L-U]**
c. Explain working principle of autoclave with neat diagram. **[CO-4, L-A]**
d. Enlist the four different vulcanization equipment's and explain any one them. **[CO-6, L-U]**

Q. 3 **Attempt any THREE** **12 Marks**

a. State advantages and disadvantages of cross axis in calendaring. **[CO-2, L-A]**
b. Draw a neat sketch of injection moulding machine and explain in brief. **[CO-4, L-U]**
c. Explain about the low pressure unreinforced hoses. **[CO-5, L-A]**
d. Explain in brief about mooney scott bath. **[CO-6, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain working principle of two roll mill with its advantages. **[CO-1, L-U]**

b. Enlist the roll configurations in calendars with its diagram. **[CO-2, L-U]**

c. Differentiate hot and cold feed extruder. **[CO-3, L-U]**

d. Define extrusion, state its advantages. **[CO-3, L-R]**

e. Define Deflashing and give its significance. **[CO-4, L-R]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain construction and working of kneader with neat sketch. **[CO-1, L-A]**

b. With neat labeled diagram explain operations of compresion moulding and transfer moulding with their advantage and disadvantages. **[CO-4, L-U]**

c. State and explain 'Roller Covering'. **[CO-5, L-A]**

****End****

EVEN 2025-26

RT23305

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Specialty Rubber**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the end use applications of EPDM. **[CO-1, L-R]**
b. State the term HNBR. **[CO-2, L-R]**
c. Draw the structure of CR. **[CO-3, L-R]**
d. Classify silicone rubber. **[CO-4, L-R]**
e. State the limitations of silicone rubber. **[CO-4, L-R]**
f. Define fluorocarbon elastomer. **[CO-5, L-R]**
g. State the types of fluoro carbon elastomer. **[CO-5, L-R]**
h. State the term of i) EVA ii) PTFE. **[CO-6, L-R]**
i. State the applications of PNR rubber. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain the effect of E/P ratio on the rebound resilience of EPDM rubber, show graphically. **[CO-1, L-U]**
b. Explain manufacturing process of silicone rubber. **[CO-4, L-U]**
c. State the applications of FKM elastomers. **[CO-5, L-R]**
d. Compare polyurethane and polynorborneres rubber. **[CO-6, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain the effect of ACN content on the glass transition temperature of NBR rubber with graph. **[CO-2, L-U]**
b. Explain the manufacturing process of CR. **[CO-3, L-U]**
c. State the specific gravity and operational temperature of silicone rubber. **[CO-4, L-U]**
d. List different FKM elastomers with their structures. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain specific gravity of EPDM rubber. **[CO-1, L-U]**
b. Draw the structure of manometers of NBR with their name. **[CO-2, L-U]**
c. Compare NBR with CR. **[CO-3, L-U]**
d. Explain distinct types of silicone rubber with different technologies. **[CO-4, L-U]**
e. State commercial types of FKM rubber. **[CO-5, L-R]**

Q. 5 Attempt any TWO **12 Marks**

a. List the diene monomers can be used in the polymerization of EPDM rubber and draw the structure of it. **[CO-1, L-U]**

b. Explain the manufacturing process of emulsion NBR. **[CO-2, L-U]**

c. Explain the effect of polymerization temperature on stereo regularity of CR. **[CO-3, L-U]**

****End****

EVEN 2025-26

RT23402

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Rubber Compounding and Product Testing**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the role of ASTM in rubber. **[CO-1, L-R]**
b. List out various raw material test of rubber. **[CO-2, L-R]**
c. State the function of mooney viscometer. **[CO-3, L-R]**
d. State the term scorch and cure rate. **[CO-3, L-R]**
e. State the term rebound resilience. **[CO-4, L-R]**
f. State the parameters to measure abrasion test. **[CO-4, L-R]**
g. State the term heat ageing. **[CO-5, L-R]**
h. State the factors affecting gas permeability in rubber materials. **[CO-6, L-R]**
i. State the physical properties of rubber. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain plasticity retention index and its measurement. **[CO-3, L-U]**
b. Explain water absorption test. **[CO-4, L-U]**
c. Explain test procedure for volume swelling. **[CO-5, L-U]**
d. Explain test on electrical conducting and anti-static rubbers. **[CO-6, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe how degree of vulcanization affects the physical properties of rubber. **[CO-1, L-A]**
b. Explain the significance of burning, chemical and environmental testing in the rubber industry. **[CO-2, L-U]**
c. Explain working of MDR. **[CO-3, L-U]**
d. Explain the procedure of moisture content test. **[CO-4, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain the role of quality control in rubber testing. **[CO-3, L-R]**
b. How does the addition of carbon black improve environmental resistance in rubber. **[CO-5, L-U]**
c. Discuss the various environmental factors that impact durability of rubber. **[CO-5, L-R]**
d. State the term : i) Promitivity ii) Precision iii) Accuracy. **[CO-6, L-R]**
e. Explain tensile test. **[CO-6, L-U]**

Q. 5 **Attempt any TWO** **12 Marks**

a. Discuss the importance of hysteresis and damping properties in dynamic applications. **[CO-1, L-U]**

b. Explain the role of stabilizer antioxidants and antiozonants in extending the life of rubber products. **[CO-2, L-U]**

c. Explain dead load test and durometer test of rubber. **[CO-4, L-U]**

****End****

EVEN 2025-26 **RT23302**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Rubber Physics**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define : (i) Stress (ii) Strain. **[CO-1, L-R]**
b. State Hooke's law. **[CO-1, L-R]**
c. Enlist various types of viscosity measuring instrument. **[CO-2, L-R]**
d. State the difference between retardation time and relaxation time. **[CO-3, L-R]**
e. State the advantages of rapid plastimeters. **[CO-4, L-R]**
f. State the factors affecting swelling of rubber. **[CO-5, L-R]**
g. How do rubber solutions differ from low molecular weight solutions? **[CO-5, L-R]**
h. State electrical properties of polymer. **[CO-6, L-R]**
i. Define : (i) Abrasion resistance (ii) Permeability. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain the process of solubility with the first law of thermodynamics. **[CO-2, L-A]**
b. Explain Maxwell model with equation. **[CO-3, L-U]**
c. Discuss the role of Mooney viscosity in predicting mixing energy and extrusion behaviour. **[CO-4, L-A]**
d. Differentiate between theta solvent and theta temperature. **[CO-5, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain Newton fluids. **[CO-2, L-U]**
b. Explain crack propagation strength test in rubber. **[CO-2, L-U]**
c. Explain ODR/MDR with diagram. **[CO-4, L-A]**
d. State the properties of flex and fatigue in rubber. **[CO-6, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. State Pascal's law. **[CO-2, L-R]**
b. Explain material response time. **[CO-3, L-U]**
c. Compare Maxwell model and four parameter model. (any three points) **[CO-3, L-A]**
d. Differentiate between swelling, dissolution and gel formation. **[CO-5, L-R]**
e. Explain Gibb's free energy equation. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain thermoplasticity and how does it beneficial for processing of polymers. **[CO-1, L-A]**

b. Compare viscometer and rheometer (any six points). **[CO-4, L-U]**

c. Explain rebound resilience with properties. **[CO-6, L-U]**

****END****

EVEN 2025-26

RT23404

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Vulcanization Systems**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L- LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the role of activator in sulphur. **[CO-1, L-R]**
b. State cross linking agents for rubber. **[CO-1, L-R]**
c. State the role of metal oxide in chloroprene cure. **[CO-2, L-R]**
d. State the meaning of half life in peroxide curing. **[CO-2, L-R]**
e. Enlist the ingredients required for NBR. **[CO-3, L-R]**
f. List the swelling techniques of cross link density. **[CO-4, L-R]**
g. Give the significance of heat stability and aging properties. **[CO-5, L-R]**
h. State the meaning of step curing. **[CO-6, L-R]**
i. State the characteristics of compression moulding. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain semi efficient cure system. **[CO-2, L-U]**
b. State the chemical structure of two accelerators. **[CO-3, L-U]**
c. State Mooney scorch time & its practical significance. **[CO-4, L-U]**
d. Classify vulcanization techniques and explain any one. **[CO-6, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. State the advantages of sulphur use in rubber industry. **[CO-1, L-R]**
b. Sketch NR standard cure rheograph. **[CO-2, L-U]**
c. Sketch a typical rheograph for any rubber and locate M_L, M_H, T_{S2}, TC_{90} and give significance of rheograph. **[CO-4, L-A]**
d. State and explain i) Rebound Resilience.
ii) Compression Set. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Differentiate vulcanized rubber and unvulcanized rubber (Any three points.) **[CO-1, L-A]**
b. State criteria for selection of accelerators for rubber compounds. **[CO-3, L-U]**
c. Explain the theory of diisocynate cure system in polyurethane. **[CO-4, L-A]**
d. State the significance of M_H on tensile strength. **[CO-5, L-U]**
e. State principle and characteristics of roto cure. **[CO-6, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. Differentiate soluble and insoluble sulphur (Any six points) **[CO-2, L-U]**

b. Enlist the accelerators used in vulcanization system along with structure and action. Explain any one in brief. **[CO-3, L-U]**

c. State principle of microwave curing. List two frequency of microwave used for cross linking. **[CO-5, L-A]**

****End****

EVEN 2025-26

ME23114

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Industrial Engineering & Management**

2:30 Hours / 60 marks Enrolment No. | | | | | | | |

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO -COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the symptoms of good plant layout. **[CO-1, L-R]**
b. Define production and productivity. **[CO-1, L-R]**
c. State the equipment used in time study. **[CO-2, L-R]**
d. State the need of ergonomics. **[CO-3, L-R]**
e. List out display applied in ergonomics. **[CO-3, L-R]**
f. State the skills of manger required in management. **[CO-4, L-R]**
g. State the advantages of on job training. **[CO-5, L-R]**
h. List out benefits provided under act to insured persons. **[CO-6, L-R]**
i. State the meaning of 'Industrial Dispute'. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Classify the production system and explain any one production system. **[CO-1, L-A]**
b. Explain basic steps of selection of work for method study. **[CO-2, L-A]**
c. Explain design of control in ergonomics applied for push button and knob. **[CO-3, L-U]**
d. Explain the levels of management. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Classify the allowances in details. **[CO-2, L-A]**
b. Explain an organizational structure with an example. **[CO-4, L-U]**
c. Explain the types of capital in financial management. **[CO-5, L-U]**
d. Explain the causes of accident in industry. **[CO-6, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain the functions of P.P.C (Production planning and control). **[CO-1, L-U]**
b. Draw the symbols which are used in method study charts. **[CO-2, L-A]**
c. State the relation between management and administration. **[CO-4, L-R]**
d. Classify the types of training in personnel management. **[CO-5, L-A]**
e. Describe about workmen's compensation act 1923 with partial and total disablement. **[CO-6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Differentiate between process layout and product layout and state the advantages of process layout. **[CO-1, L-U]**

b. Explain outline process charts and two hand charts with an examples. **[CO-2, L-A]**

c. Explain ABC analysis of material. **[CO-5, L-U]**

****End****

EVEN 2025-26 **RT23401**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Thermoplastic Elastomer**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the advantages and applications of TPE. **[CO-1, L-R]**
b. Enlist the types of TPE. **[CO-1, L-R]**
c. Define PEBK and state its features. **[CO-2, L-R]**
d. State the applications of styrenic in TPE. **[CO-2, L-R]**
e. State the difference between SEB's and SBS. **[CO-2, L-R]**
f. Compare TPE and TPV (four points). **[CO-4, L-R]**
g. State the applications of polyolefin elastomers. **[CO-4, L-R]**
h. State the applications of nitrile nylon blends. **[CO-5, L-R]**
i. State the properties of TPU's. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Compare TPE over conventional rubber. **[CO-1, L-U]**
b. Draw the structure of any two styrenic TPE with hard and soft segments. **[CO-2, L-A]**
c. Explain dynamic vulcanization. **[CO-3, L-U]**
d. Explain calendaring process. **[CO-5, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain extruder for TPE. **[CO-2, L-U]**
b. Explain how different properties such as tensile, impact etc. vary with density and molecular weight in polyethylene. **[CO-3, L-U]**
c. Explain the manufacturing process of EPDM/PP blends. State its advantages. **[CO-5, L-U]**
d. State the term COPA. Compare its properties with COPE. **[CO-6, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Draw the structure of any two fluro plastic with its properties. **[CO-1, L-U]**
b. Explain the process of vicat softening point. **[CO-1, L-U]**
c. Explain blow moulding. **[CO-4, L-U]**
d. Draw the structure of PE and PVC. **[CO-4, L-U]**
e. Differentiate between nylon 6 and nylon 66. **[CO-6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Explain co-polymerization with its example. **[CO-3, L-U]**

b. State the parameters that affects the impact resistance of TPE in brief. **[CO-4, L-U]**

c. Explain the uses of three important ingredient used in engineering plastics. Also explain the typical process of compounding. **[CO-6, L-A]**

****End****

EVEN 2025-26 **RT23301**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Latex Technology**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L-LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the difference between NR latex and synthetic latex. **[CO-1, L-R]**
b. State the iso-electric point of latex. **[CO-2, L-R]**
c. State the importance of PH in latex. **[CO-3, L-R]**
d. Enlist anti-oxidant used in latex compounding. **[CO-4, L-R]**
e. Define : (i) Emulsion method (ii) Dispersion method. **[CO-5, L-R]**
f. Name the soap used for dispersion of inorganic filler in water. **[CO-5, L-R]**
g. Enlist different types of mold used in latex. **[CO-5, L-R]**
h. Name the constituent of latex causes allergy to human body. **[CO-6, L-R]**
i. Name the types of allergies in latex. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain about cultivation of natural rubber latex step by step. **[CO-1, L-A]**
b. State the factors which affect the yield of latex. **[CO-2, L-A]**
c. Explain particle size distribution of NR latex and state its properties. **[CO-3, L-A]**
d. State the types of vulcanizing agents of latex explain any one. **[CO-4, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe delayed action gelling system. **[CO-3, L-U]**
b. Enlist different fillers and pigments used in latex compounding with its significance. **[CO-4, L-U]**
c. Differentiate between ball mill and pebble mill. **[CO-5, L-U]**
d. Explain latex reaction and allergy. **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Enlist the regions where heavea brasiliensis tree was found and the conditions required to growth of tree. **[CO-1, L-U]**
b. Define tapping and centrifugation in latex. **[CO-2, L-R]**
c. State the terms of Gelation. **[CO-3, L-A]**
d. Name the remedies used for latex allergies. **[CO-6, L-A]**
e. State casting process in latex. **[CO-6, L-A]**

EVEN 2025-26

Q. 5 Attempt any TWO **12 Marks**

a. Enlist the techniques used for preserving the latex and explain any one of them. **[CO-2, L-A]**

b. Differentiate between planetary mixer and turbo mixer. **[CO-5, L-U]**

c. Explain briefly about the flex resistant tester. **[CO-5, L-A]**

****END****

EVEN 2025-26

RT23303

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **General Purpose Rubber**

2:30 Hours / 60 marks Enrolment No.

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Draw the structure of natural rubber. [CO-1, L-R]
b. State the term ISNR. [CO-1, L-R]
c. Micro structure of IR gives good elasticity give reason. [CO-2, L-U]
d. State the tern monomers. [CO-3, L-R]
e. State the grades of IIR differ from each other. [CO-5, L-R]
f. Compare PBR and IIR (two points). [CO-5, L-R]
g. Define reclaimed rubber. [CO-6, L-R]
h. State the advantages of reclaimed rubber. [CO-6, L-R]
i. State the type of gases used in cryogenic process. [CO-6, L-R]

Q.2 Attempt any THREE **12 Marks**

a. Explain process of tapping in brief. [CO-1, L-U]
b. Explain structure properties relationship of IR. [CO-2, L-U]
c. Explain the process of cold and hot SBR. [CO-3, L-U]
d. Draw the chemical structure of PBR and state its application. [CO-4, L-A]

Q. 3 Attempt any THREE **12 Marks**

a. Explain technically specified natural rubber in brief. [CO-1, L-U]
b. Explain polymerization process for IR. [CO-2, L-U]
c. Explain how styrene content affect the glass transition temperature of SBR. [CO-3, L-U]
d. Compare reclaim rubber and crumb rubber. [CO-6, L-U]

Q. 4 Attempt any FOUR **12 Marks**

a. List out conventional grades of natural rubber. [CO-1, L-R]
b. State the end use application of IR. [CO-2, L-R]
c. Compare solution and emulsion SBR. [CO-3, L-U]
d. State special properties of PBR. [CO-4, L-R]
e. Explain halo butyl rubbers. [CO-5, L-U]

Q. 5 Attempt any TWO **12 Marks**

a. Explain structure property relationship for polybutadiene rubber. [CO-4, L-U]
b. Compare PBR with IIR with its structure. [CO-5, L-U]
c. Explain reclaiming process for reclaimed rubber. [CO-6, L-U]

****End****

EVEN 2025-26 **AM23306**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Strength of Material**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO -COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define stress and write its mathematical formula. **[CO-1, L-R]**
b. State concept of deformation. **[CO-1, L-R]**
c. Define volumetric strain. **[CO-2, L-R]**
d. Define moment of Inertia. State its SI unit. **[CO-3, L-R]**
e. Enlist types of beams and loads. **[CO-4, L-R]**
f. Define point of contra flexure. **[CO-4, L-R]**
g. Define torsional rigidity. **[CO-5, L-R]**
h. Define direct stress and bending stress. **[CO-6, L-R]**
i. Define eccentric load. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. A steel rod 3m long is at 40^0C. The temperature of rod increased to 15^0C. Find
   (i) Free Expansion of rod.
   (ii) Temperature stress produced if expansion is prevented and nature of stress.
   (iii) Stress produced if 2mm expansion is permitted if a = 12 X $10^{-6}/^0$C and E= 200GPa. Take bar diameter = 16mm. **[CO-1, L-A]**
b. Explain : (i) Proof resilience (ii) Modulus of resilience. **[CO-2, L-U]**
c. Explain parallel axis theorem. **[CO-3, L-U]**
d. A simply supported beam of length 6m, carries point load of 3kN and 6kN at distances of 2m and 4m from the left end. Draw the shear force and bending moment diagram for the beam. **[CO-4, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. State advantages and limitations of composite sections. **[CO-1, L-U]**
b. Determine the location of centroid and M.O.I. of an I section having following dimensions : (i) Top flange – 60mm X 20mm
   (ii) Bottom flange - 100mm X 20mm
   (iii) Web – 20mm X 100mm **[CO-3, L-A]**
c. State assumptions made in theory of torsion. **[CO-5, L-U]**
d. Calculate maximum eccentricity for a hollow circular section having external diameter and internal diameter equal to 200mm & 130mm respectively, so that stress distribution is at same nature. **[CO-6, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. State working stress for brittle and ductile material. **[CO-1, L-U]**

b. Draw and explain stress-strain curve for ductile material. **[CO-2, L-U]**

c. Explain the concept of radius of gyration in brief. **[CO-3, L-U]**

d. A hollow shaft is to transmit 300 kW power at 80rpm. If the shear stress should not exceed 60N/mm^2 and internal diameter is 0.6 of the external diameter, find the external and internal diameter assuming the maximum torque is 1.4 times the mean. **[CO-5, L-A]**

e. Explain : No tension condition for a section. **[CO-6, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. A steel cube of 60mm side is subjected to a force of 4kN (tensile), 6kN (compressive) and 2kN (tensile) along x,y,z direction respectively determine the change in volume of the block. Take E = 200GPa & Poisson's ratio μ=0.3. **[CO-2, L-A]**

b. A cantilever of length 2.0m carries a uniformly distributed load of 1kN/m run over a length of 1.5m from free end. Draw the shear force and bending moment diagram for a cantilever. **[CO-4, L-A]**

c. Determine the diameter of a solid shaft which will transmit 200kW at 250rpm. The maximum shear stress should not exceed 30N/mm^2 and twist should not be more than 1^0 in shaft of length of 2m.
Take modulus of rigidity = 1 X10^{5}N/mm^2. **[CO-5, L-A]**

****End****

EVEN 2025-26 **RT23502**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Reverse Engineering & Analysis of Rubber Products**

2:30 Hours / 60 marks Enrolment No.

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. State the term solvent extraction. **[CO-1, L-R]**
b. Define TGA. **[CO-2, L-R]**
c. State the characteristics of polymer identification in the method of FTIR/TGA. **[CO-2, L-R]**
d. State the application of optical microscope. **[CO-3, L-R]**
e. State the Name of common type of polymer additives. **[CO-5, L-R]**
f. Explain the role of thermal analysis in polymer additives **[CO-5, L-R]**
g. Compare transition temperature and melting temperature. (two points) **[CO-5, L-R]**
h. State the role of phosphorus based flame retardants. **[CO-6, L-R]**
i. State the difference between additive and reactive flame retardants. **[CO-6, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain how ash content can be improvised for rubber latex. **[CO-1, L-A]**
b. State the advantages of FTIR over infrared spectroscopy. **[CO-3, L-A]**
c. Explain the importance of crosslinking in rubber blends. **[CO-4, L-A]**
d. State the challenges in isolating the thermal effects of specific additives in a polymer blend. **[CO-5, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain acetone extracts in cured rubber. **[CO-1, L-A]**
b. Explain how you would determine the amount of carbon black filler in a rubber compound using chemical method. **[CO-2, L-A]**
c. State the advantages of rubber composite over pure rubber materials. **[CO-4, L-U]**
d. Explain the significance of Differential scanning calorimetry. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain the chemical degradation method used to identify the base polymer. **[CO-2, L-U]**

b. Compare Acrylonitrile and Acrylic rubber. **[CO-3, L-U]**

c. Explain the composition of C_A, C_N & C_P in aromatic Napthali Nic / Paraffin oil in %. **[CO-3, L-A]**

d. Name three flame resistance in polymer. **[CO-5, L-A]**

e. State the various test methods used to evaluate polymer flammability. **[CO-6, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. i) State the limitations of chemical method in rubber reverse engineering. **[CO-2, L-R]**

ii) State the name of various detectors used in Gas chromatography. **[CO-3, L-R]**

b. i) State the applications of DSC. **[CO-4, L-R]**

ii) Descriminate burning behaviour and residue of silicone / NR rubber. **[CO-5, L-U]**

c. Explain how solubility differences are used for polymer fractionation. **[CO-6, L-A]**

****End****