21

Optional Paper

Mechanical Engineering

Paper – II

Time : 3 Hours   Maximum Marks : 200

IMPORTANT NOTES / महत्वपूर्ण निर्देश

(A)   Please fill up the OMR Sheet of this Question Answer Booklet properly before answering. Please also see the directions printed on the obverse before filling it.
प्रश्नोत्तर पुस्तिका में प्रश्न हल करने से पूर्व उसके संलग्न ओ.एम.आर. पत्रक को भली प्रकार भर लें । उसे भरने हेतु उसके पृष्ठ भाग पर मुद्रित निर्देशों का अध्ययन कर लें ।

(B)   The question paper has been divided into three Parts - A, B and C. The number of questions to be attempted and their marks are indicated in each part.
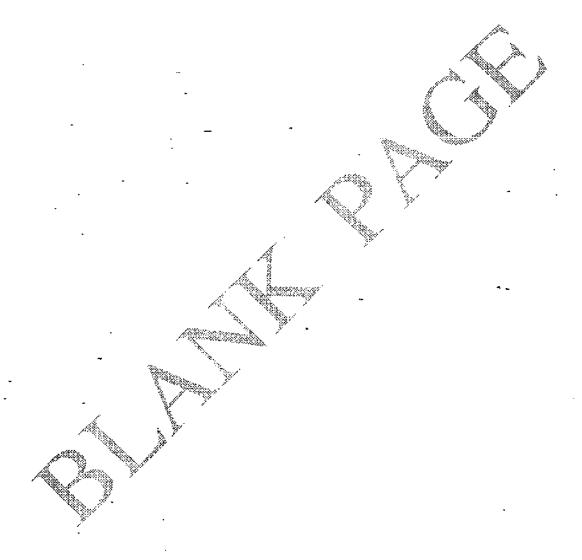प्रश्न-पत्र अ, ब और स तीन भागों में विभाजित है । प्रत्येक भाग में से किये जाने वाले प्रश्नों की संख्या और उनके अंक उस भाग में अंकित किये गये हैं ।

(C)   Attempt answers in **English**.
उत्तर अंग्रेजी भाषा में दीजिये ।

(D)   Answers to all the questions of each part should be written continuously in the script and should not be mixed with those of other parts. In the event of candidate writing answers to a question in a part different to the one to which the question belongs, the question will not be assessed by the examiner.
उत्तर पुस्तिका में प्रत्येक भाग के समस्त प्रश्नों के उत्तर क्रमवार देने चाहिये तथा एक भाग में दूसरे भाग के उत्तर नहीं मिलाने चाहिये । एक भाग में दूसरे भाग के प्रश्न के उत्तर लिखे जाने पर ऐसे प्रश्न को जाँचा नहीं जा सकता हैं ।

(E)   The candidates should not write the answers beyond the limit of words prescribed in parts A, B and C failing this the marks can be deducted.
अभ्यर्थियों को भाग अ, ब और स में अपने उत्तर निर्धारित शब्दों की सीमा से अधिक नहीं लिखने चाहिये। इसका उल्लंघन करने पर अंक काटे जा सकते हैं ।

(F)   <u>In case the candidate makes any identification mark i.e. Roll No./Name/Telephone No./Mobile No. or any other marking either outside or inside the answer book, it would be treated as resorting to using unfair means. In such a case his candidature shall be rejected for the entire examination by the Commission.</u>
अभ्यर्थी द्वारा उत्तर पुस्तिका के अंदर अथवा बाहर पहचान चिन्ह यथा – रोल नम्बर / नाम / मोबाईल नम्बर / टेलीफोन नम्बर लिखे जाने या अन्य कोई निशान इत्यादि अंकित किये जाने को अनुचित साधन मान जायेगा। आयोग द्वारा ऐसा पाये जाने पर अभ्यर्थी की सम्पूर्ण परीक्षा में अभ्यर्थिता रद्द कर दी जायेगी ।

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Note :   Attempt all the **twenty** questions. Each question carries 2 marks. Answer should not exceed **15** words.

1   What is the criterion to distinguish between thin and thick cylinder?

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2   What is module in gear?

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3   Define tool signature.

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4   A steel plate of section 50 × 10 mm is bent into an arc of 1000 mm radius. Determine the bending stress induced and the bending moment required to bend the plate. Take $E = 2.1 × 10^5$ MPa.

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5   Explain the difference between a lower and higher kinematic pair.

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6   State Kennedy's Theorem as referred to kinematic links in mechanisms.

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7   What is interference in gearing?

8   Mention the various types of chips produced during metal cutting.

9   Define strain hardening.

10 Write any two abrasive materials used in Ultra Sonic Machining.

11 List advantages of a Machining Centres.

12 What is the difference between free, forced, vibration?

13 Mention different straight line mechanisms used as lower pairs.

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14 Mention the various external sources of recruitment.

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15 Write any two objectives of Ergonomics?

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16 What is Hooke's joint?

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17 Define Reverted gear train.

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18 Mention the applications of linear programming.

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19 Mention any four work measurement techniques.

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20 What is the difference between hypo-eutectoid and hyper-eutectoid steels?

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Note :   Attempt all the **twelve** questions. Each question carries 5 marks. Answer should not exceed **50** words.

21   What are the factors to be considered for designing a machine component?

22   What is the function of a Mechanical Spring? Classify the Mechanical Spring.

23 List out the variables affecting tool life.

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24 Explain the term slip and creep as referred to belt drive.

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25 Describe the objective of production planning.

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26 Name any ten elements of surface roughness.

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27 Mention different of wage incentive plans.

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28 Describe the principles of scientific management.

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29 Differentiate between job shop and flow shop layout with examples.

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30 What are the principles of material handling?

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31 In a Cast Iron component having a 35 mm cored hole, and internal relief is to be provided over a length of 150mm. Determine the total time to machine the bore (in two pieces) and turning the relief (in one cut) in the component. Cutting speed is 15 mm/min. and a feed 0.10 mm/rev.

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32 Explain Hungarian method in solving the Assignment models.

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Note :   Attempt any 5 questions. Each question carries 20 marks. Answer should not exceed 200 words.

35   A bronge spur pinion rotating at 560 rpm drives a cast steel gear. The transmission ratio is 4. The pinion has 18 teeth with 20 full depth involute profile, the module being 5mm. The face width of gearing is 25mm. Determine the power that can be transmitted from the stand point of strength point of view. Static strength for bronge is 80 MPa, and that for cast steel is 100 MPa.

34. What is a clutch? Classify the clutch. A multiple disc clutch transmits 50 kw of power at 1400 rpm. Axial intensity of pressure is not to exceed 0.15 N/mm^2, and the coefficient of friction for the friction surface is 0.12. The inner radius of the disc is 80 mm, and is 0.7 times the outer radius. Determine the number of discs required to transmit the given power. Assume uniform wear condition.   5+5+10

35 Explain in detail the mechanism of Electrical discharge Machining.

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36 An enterprises consume 48000 units of a material costing Rs. 1.20 per unit. Procurement cost for each order is Rs. 45 and the carrying cost rate is 15% per year of inventory cost.

(a) Find the Economic Order Quantity.

(b) Supposing that the enterprise operates 300 days a year and follows EOQ purchasing policy and that the procurement time is 12 days. If the safety stock is 500 units, find the reorder point, the maximum, minimum and avg. level of inventory.

37 The following is the planning budget of M/s ABC Ltd. Budgeted sales volume is 200000 units with unit sales price of Rs. 25/-.

Budgeted Costs	Fixed	Variable
Direct Material		9,00,000
Direct Labour Cost		10,00,000
Factory overheads	80,000	3,00,000
Administrative Overheads	6,00,000	2,00,000
Distribution costs	6,00,000	4,00,000
Total	20,00,000	28,00,000
Budgeted Profit		Rs. 8,00,000

Compute the break even point if:

(i)   10% increase is effected in fixed cost.

(ii) 10% increase is effected in variable cost.

(iii) An increase of 10% in sales price which will reduce the sales volume by 5%.

38 What do you mean by dimensional synthesis of mechanism? Mention the type of synthesis and derive the fundamental equation of correct gearing for steering system in automobiles.

39 A Hooke's joint connects two shafts whose axes intersect at 18°. The driving shaft rotates at a uniform speed of 210 rpm. The driven shaft with attached masses has a mass of 60 kg and radius of gyration of 120 mm. Determine the (i) torque required at the driving shaft if a steady torque of 180 N-m resist rotation of the driven shaft and the angle of rotation is 45°. (ii) angle between the shafts at which the total fluctuation of the speed of the driven shaft is limited to 18 rpm.