

AQ 1011728

JD 2014

GENERAL ENGINEERING / सामान्य इंजीनियरी
PAPER II / प्रश्न-पत्र II

Time allowed : 2 Hours

Maximum Marks : 300

निर्धारित समय : दो घण्टे

अधिकतम अंक : 300

Attention :

1. Paper consists of **Part A (Civil and Structural)** and **Part B (Electrical)** and **Part C (Mechanical)** and only one Part is to be attempted as per option given in the Application Form. Candidates should attempt **5 questions in all**. All questions carry **equal marks**.
2. Each candidate will be **given one Answer Book**.
3. Answers to all questions must be written in one language, i.e., either in English or in Hindi according to the option given by the candidate in his/her Application Form. Candidates are not allowed to write the answers partly in English and partly in Hindi.
4. Candidates must write their Name, Roll No., Ticket No., Name of the Examination and Subject at the prescribed place on the cover page of the Answer Book correctly. Candidates must also put their signature, and left-hand thumb impression on the cover page at the prescribed place. The above instructions must be fully complied with failing which the Answer Book will not be evaluated and zero mark will be awarded.
5. No credit will be given for answers written in a language other than the one opted by the candidate.
6. Necessary tables of IS 456 : 2000 Code of Practice are given at the end of Part A for use of candidates attempting Civil and Structural part.
7. "Mobile phones and wireless communication devices are completely banned in the examination halls/rooms. Candidates are advised not to keep mobile phones/any other wireless communication devices with them, even switching it off, in their own interest. Failing to comply with this provision will be considered as using unfair means in the examination and action will be taken against them including cancellation of their candidature."

ध्यान दीजिए:

1. प्रश्न-पत्र में भाग क (सिविल एवं संरचनात्मक) और भाग ख (विद्युत) एवं भाग ग (यांत्रिक) और आवेदन-पत्र में दिए गए विकल्प के अनुसार केवल एक भाग का ही उत्तर दिया जाना है। अभ्यर्थियों को कुल पाँच प्रश्नों का उत्तर देना है। सभी प्रश्नों के अंक बराबर हैं।
2. प्रत्येक अभ्यर्थी को केवल एक उत्तर-पुस्तिका दी जाएगी।
3. सभी प्रश्नों के उत्तर अभ्यर्थी द्वारा अपने आवेदन-पत्र में दिए गए विकल्प के अनुसार किसी एक भाषा में अर्थात् अंग्रेजी या हिन्दी में, दिए जाने चाहिए। अभ्यर्थियों को कुछ उत्तर अंग्रेजी में और कुछ उत्तर हिन्दी में लिखने की अनुमति नहीं है।
4. अभ्यर्थी उत्तर-पुस्तिका के आवरण पृष्ठ पर निर्धारित स्थान में अपना नाम, रोल नंबर, टिकट नंबर, परीक्षा का नाम तथा विषय सही-सही अवश्य लिखें। अभ्यर्थी आवरण पृष्ठ पर निर्धारित स्थान में अपने हस्ताक्षर एवं बाएँ हाथ के अँगूठे का निशान भी अवश्य लगाएँ। उपर्युक्त अनुदेशों का पूरी तरह अनुपालन किया जाए, अन्यथा उत्तर-पुस्तिका को नहीं जाँचा जाएगा और शून्य अंक दे दिया जाएगा।
5. अभ्यर्थी द्वारा दिए गए विकल्प की भाषा के अतिरिक्त किसी अन्य भाषा में दिए गए उत्तरों के लिए कोई अंक नहीं दिए जाएँगे।
6. सिविल एवं संरचनात्मक भाग की परीक्षा देने वाले अभ्यर्थियों के प्रयोग के लिए आई.एस. 456 : 2000 प्रेक्टिस कोड की आवश्यक सारणियाँ भाग क के अन्त में दी गई हैं।
7. "परीक्षा हॉलों/कमरों में मोबाइल फोन तथा बेतार संचार साधन पूरी तरह निषिद्ध है। प्रत्याशियों को उनके अपने हित में सलाह दी जाती है कि मोबाइल फोन/किसी अन्य बेतार संचार साधन को स्विच ऑफ करके भी अपने पास न रखें। इस प्रावधान का अनुपालन न करने को परीक्षा में अनुचित उपायों का प्रयोग माना जाएगा और उनके विरुद्ध कार्रवाई की जाएगी, उनकी अभ्यर्थिता रद्द कर देने सहित।"

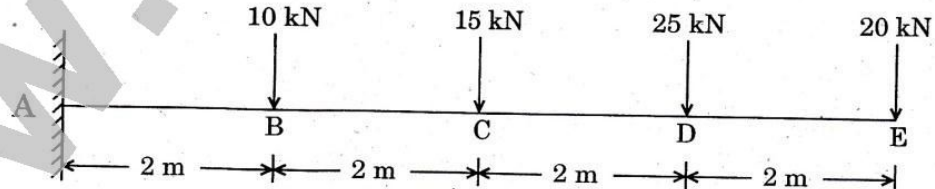
JD 2014

1

P.T.O.

PART C
General Engineering
(MECHANICAL)

1. (a) Differentiate between single point and multipoint cutting tool. 15
- (b) Find the speed of a shaft which is driven with the help of a belt by an engine running at 300 rpm. The diameter of the engine pulley is 60 cm and that of the shaft is 40 cm. 15
- (c) Explain the role of cutting fluid in machining. 15
- (d) Explain the following terms : 15
- (i) Module
- (ii) Pressure angle
- (iii) Addendum
2. (a) Define the following terms : 15
- (i) Angle of friction
- (ii) Coefficient of friction
- (iii) Angle of repose
- (iv) Poisson's ratio
- (v) Elastic limit
- (b) A cantilever beam of 8 m length is subjected to point loads of 10 kN, 15 kN, 25 kN, and 20 kN at distances of 2 m, 4 m, 6 m and 8 m respectively from the fixed end as shown in Figure 1. Draw the shear force diagram and bending moment diagram. 15



- (c) Find the lowest speed at which 250 kW could be transmitted through a shaft of diameter 63 mm. The maximum shear stress is limited to 50 MPa. If length of the shaft is 6 m, find the angle of twist. Take $G = 80 \text{ GPa}$. 15
- (d) In separate experiments, Young's Modulus and Modulus of Rigidity of a material have been determined as 120 GPa and 50 GPa respectively. Calculate the Poisson's Ratio and Bulk Modulus of the material. 15

3. (a) Compare the working principle of 4-stroke and 2-stroke cycles of internal combustion engines. 15
- (b) State and explain the Clausius statement of the second law of thermodynamics. 15
- (c) A mixture of gases expands at constant pressure from 1 MPa, 0.03 m^3 to 0.06 m^3 with 90 kJ heat transfer to the system. There is no work other than 'work done' on a piston. Find the change in internal energy of the mixture. 15
- (d) The properties of a certain fluid are related as follows : 15
- $$u = 196 + 0.718 t$$
- $$pv = 0.287 (t + 273)$$
- where u is the specific internal energy (kJ/kg), t is in $^{\circ}\text{C}$, p is pressure (kN/m^2), and v is specific volume (m^3/kg). For this fluid, find C_u and C_p .
4. (a) A tank contains a liquid of specific gravity 0.80. Find the absolute pressure and gauge pressure at a point which is 2 m below the free surface of the liquid. The atmospheric pressure head is equivalent to 760 mm of mercury. 15
- (b) Define the following and give one practical example of each : 15
- Laminar flow
 - Turbulent flow
 - Steady flow
 - Uniform flow
 - Unsteady flow
- (c) What is a centrifugal pump ? Explain the working of a single-stage centrifugal pump with sketches. 15
- (d) Derive the expression : 15
- $$C_d = C_v \times C_c$$
- where C_d = co-efficient of discharge
 C_v = co-efficient of velocity
 C_c = co-efficient of contraction
5. (a) What is the difference between soldering and brazing ? 15
- (b) Describe with the help of neat sketches, TIG welding and MIG welding 15
- (c) What are the common defects of casting ? State their causes and remedies. 15
- (d) What are the advantages of centreless grinding ? 15
6. (a) Explain the various safety precautions associated with lathe. 15
- (b) Define tool life and name the variables which affect tool life. 15
- (c) What is a siphon ? Where is it used ? Explain its working principle. 15
- (d) Sketch a schematic diagram of a steam power plant and explain the various processes of Rankine cycle on T-S or p-v diagram. 15